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VARIATIONS IN THE PROXIMAL CAVITY FOR A GOLD FOIL FILLING

By R. O. GREEN, D.D.S.; M. O. PATTRIDGE, D.D.S., and W. J. SIMON, D.D.S.,
Minneapolis, Minn.

THE first axiom for a successful gold foil restoration of the proximal areas of anterior teeth is suggested by a word, and the word is "access." So often, the neophyte gold-foil operator "crams" so many facts and statements regarding outline form, resistance form and retention form that he completely overlooks the fundamental principles of convenience form, which literally means "access." The predetermination of the outline form is of only secondary importance when it does not include convenience form or access for filling. A cavity with a perfect outline form, but lacking access for filling is no cavity for a gold foil filling.

The word access need not imply excessive cutting or mutilation of the tooth. Access for filling with gold foil need not complicate the outline form, the resistance form or the retention form, and yet it is basic that unless there is access, the preparation of the cavity will lack these principles. Therefore, it is logical to assume that if access is to be gained without mutilating the tooth, the teeth must be separated.

Two methods of separation have been generalized: the so-called rapid method and the slow method. The rapid method pertains to a mechanical screw wedge device in which the force applied has an overwhelming advantage over the natural resistance of the tooth. The use of a mechanical separator in preparing a cavity is frowned upon at the University of Minnesota. In the European literature,[1] the gold foil filling is frequently condemned because it is thought that the condensation process traumatizes the pulp. One may rightly question whether the traumatization of the pulp during condensation is nearly so detrimental to the vitality of the tooth as the strangulation caused and maintained for from one minute to fifteen minutes with a mechanical separator.[2] The method of separation preferred at the University of Minnesota is the slow method, in which materials that expand on absorption of saliva are used. Cotton with a grass line

From the University of Minnesota, School of Dentistry, Division of Operative Dentistry.

ligature or dental floss is used. Figure 1 illustrates the three steps in utilizing cotton for separation.

In Figure 1, A, the cavity has been blocked out to the extent that all margins are free and a ligature is inserted in the interproximal space. Figure 1, B, illustrates the packing of the cavity with dry cotton. Unless there is a condensed wedge of cotton, little separation is effected. In Figure 1, C, the cotton is tied with a surgeon's knot on the labial surface, which somewhat restricts the action of the expanding cotton to a mesial and, opposite, a distal force. The swelling of the cotton will produce a painless separation in a day or two. If there is soreness after separation with cotton, baseplate gutta-percha can be placed in the blocked out, separated cavity and left until the tooth to be worked on is comfortable. Wood wedges and rubber can also be used for slow separation; but, because these substances exert a force immediately on being inserted, their use often causes more acute soreness of pericemental fibers. It is interesting to note that gutta-percha in the anterior teeth does not of itself produce separation, and that its flow under incisal stress is very limited. However, it may be used to hold a separation that has been made previously by either the slow or the rapid method, thus providing a rest period, as indicated in any orthodontic procedure.

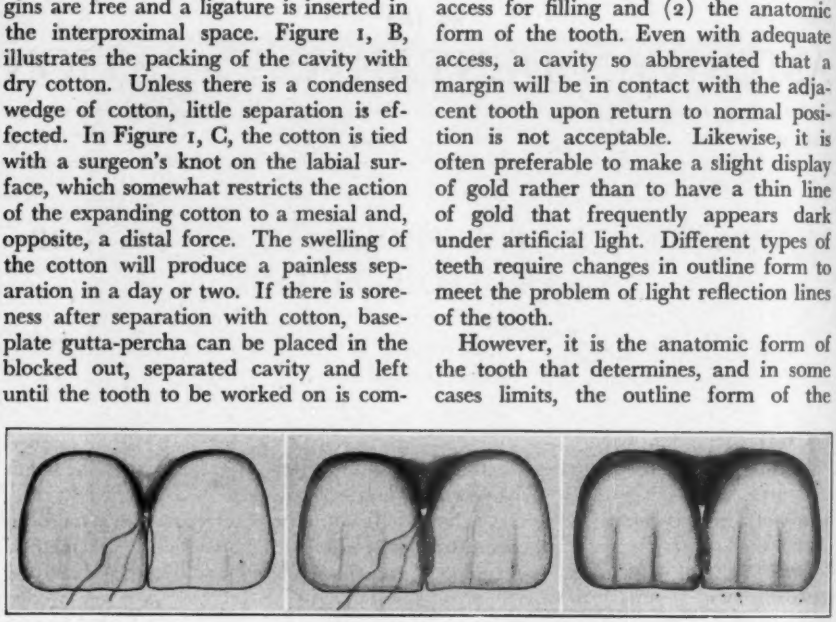

Fig. 1.—Steps in utilizing cotton for slow separation.

Having separated the teeth, one is ready to consider the outline form of the cavities in the anterior teeth. There is no universal fundamental outline form for all cavities in anterior teeth; but there are principles involved that are basic. The application of these basic principles varies with the anterior tooth being prepared, in accordance with (1) access for filling and (2) the anatomic form of the tooth. Even with adequate access, a cavity so abbreviated that a margin will be in contact with the adjacent tooth upon return to normal position is not acceptable. Likewise, it is often preferable to make a slight display of gold rather than to have a thin line of gold that frequently appears dark under artificial light. Different types of teeth require changes in outline form to meet the problem of light reflection lines of the tooth.

However, it is the anatomic form of the tooth that determines, and in some cases limits, the outline form of the cavity. In the anatomic form of the central and lateral incisors, the geometric outline from an incisal aspect is triangular with the shortest slope on the distal aspect. For this reason, proximal cavities on the distal surfaces of these teeth have to be opened a trifle more than cavities on the mesial surfaces.

Figure 2 illustrates four aspects of a prepared mesial cavity on an upper central incisor.

Figure 2, A, illustrates the proximolabial aspect of the finished cavity. The labial outline is parallel to the long axis of the tooth or slightly diverges toward the median line from the gingival to the incisal area. Such an outline is not antagonistic to the lines of the tooth, whereas a cavity opened excessively at

the gingival area is definitely antagonistic and displays more gold; which meets objection from many patients.

Figure 2, B, illustrates a proximal aspect of the finished cavity. The gingival seat should either be flat or should follow somewhat the curvature of the cervical line. The gingival seat should be under the free gum margin. However, when the gums have receded, it is necessary to carry the gingival seat somewhat beyond the contact with the adjacent tooth. Likewise, the cavity is so cut that a line angle exists between the gingival wall and the lingual wall. Mechanically, this line angle permits greater access to the linguo-axiogingival retention point and reduces the liability of splitting the lingual enamel plate during condensation. The lingual wall is cut back to the crest of the marginal ridge so that it is parallel to the cleavage lines in the enamel. A short cavosurface bevel, which frequently has been advocated on this margin, is considered superfluous. The short bevel leaves a margin making the finishing difficult in that the thin layers of gold overlying the bevel are ragged; i.e., without definite demarcation. A long bevel from the depth of the cavity is preferable. There are three factors governing the extension of the lingual wall: first, the extent of the caries; second, the anatomic form of the marginal ridge, and, third, access for filling. The lingual plate of enamel unsupported by dentin should never be allowed to remain, since it soon disintegrates and the margin

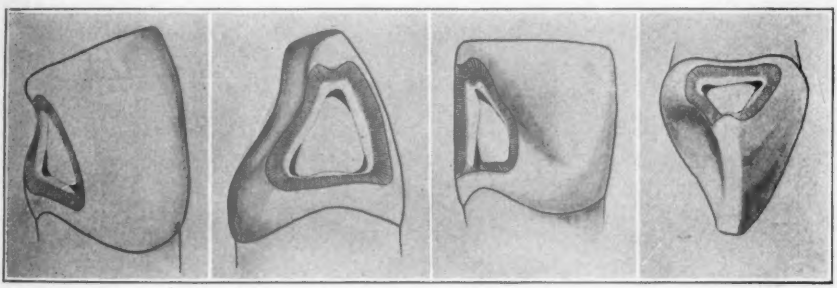

Fig. 2.—Four aspects of cavity in upper central incisor.

If the cavity is not cut far enough lingually, access for filling is limited. Likewise, the gingival seat should be extended far enough gingivally so that it is possible to place the retention forms in the part of the tooth having a greater bulk of dentin.

Since the enamel rods become shorter as they approach the enamel-cementum junction, care should be exercised in beveling the cavosurface angle at the gingival seat. The bevel should never exceed more than approximately one-third of the width of the gingival seat since it reduces the resistance form of the cavity.

Figure 2, C, illustrates a proximo-lingual aspect of the finished cavity. takes on a bluish cast, due to stains in the saliva, and ultimately fails even though the filling remains intact. For this reason, the linguo-axiogingival retention point should be prepared with caution. The linguo-axiogingival retention starts as a point angle drawn incisally in dentin under the lingual wall as a line angle, first as an acute angle, gradually becoming a right angle and, as it approaches that area of the tooth adjacent to the lingual fossa, an obtuse angle, and continues as such into the incisal retention form. This aspect also illustrates the position of the incisal retention form. The masticatory stress placed upon an upper proximal gold foil filling is normally from the lingual direction. There-

fore, the stress-receiving incisal retention form is made in dentin beneath the labial incisal plate of enamel.

Figure 2, D, shows an incisoproximal aspect of the finished cavity. This figure illustrates what is commonly referred to as the double bevel of the incisal angle. In reality, it is the net result of preparing a cavity with the labial outline parallel to the long axis of the tooth. The double bevel leaves a strong, well-supported incisal angle, and also provides greater access for the correct positioning of the retentive resistance forms as well as access for condensation. Obviously, there are cases in which the double bevel cannot be used. The square, tapering and ovoid types of teeth require varied treatment at the incisal angle. Likewise the cavity is opened excessively because of caries on the lingual and the labial aspects, it is favorable to a continuous resistance form at the junction of the axial wall and gingival wall from one retention point to the other.

The cavities suitable for gold foil in the lower anterior central and lateral incisors and in the mesial aspect of the cuspids are next to be considered. These teeth are the least susceptible to dental caries of all teeth in the human dentition. The proximal cavity on the lower anterior teeth cannot be prepared in the same manner as a cavity on the upper anterior teeth. Fortunately, when caries occurs in the lower anterior teeth, the lesion is more to the labial aspect than to the lingual and is usually gingivally from

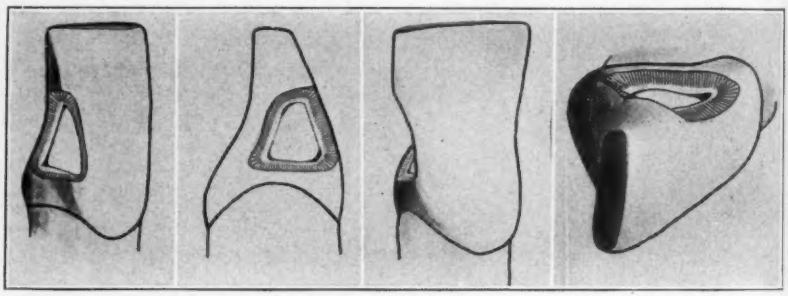

Fig. 3.—Four aspects of cavity, not including contact point, in lower central incisor.

abrasion, attrition and erosion of the incisal edge complicate the finishing of the incisal angle. Thus, it is left to the judgment of the operator as to whether the double bevel is indicated. This aspect also illustrates the direction of the gingival retentive resistance forms, which bisect the angles; namely, the linguogingival and the labiogingival, and are divergent one from the other. This often brings up the question whether these retentive resistance forms should be drawn together, forming a line angle resistance at the gingival seat. In a normal cavity, these forms should be drawn only one-third of the labiolingual distance on the gingival seat. However, if the contact point. In preparing a cavity for gold foil in lower anterior teeth where the lesion is very small, as in people with senile decay, it is advisable to violate the rule of involving the contact point. This violation is rarely permitted in preparing a cavity for gold foil in the upper anterior teeth. While separation of the lower anterior teeth is difficult because of the intralocked position of these teeth between cuspids, no filling should be attempted until some separation has been attained. Likewise, if a perfectly condensed margin in the incisal part of the cavity happens to return to contact with the adjacent tooth, the operator should not be censored, although

contact can usually be avoided by opening the embrasure slightly. These lower teeth are relatively immune to dental caries and a margin of gold foil at the contact point area will give longer service than a plastic cement under the same conditions.

Figure 3 illustrates four aspects of a prepared mesial cavity on a lower central incisor which does not include the contact point.

Figure 3, A, illustrates a labial aspect of the prepared cavity. While the labial cavity outline is parallel to the long axis of the tooth, it is cut excessively for straight labial access. This excessive cutting on the labial surface is tolerated because the lower anterior teeth are usually hidden behind the lower lip and cessible for filling and it conserves tooth structure in an area subject to heavy incising stresses. The gingival wall and the incisal edge diverge labially, thus rendering the lingual wall accessible.

In Figure 3, B and C, the lingual wall is left intact. Obviously, if the carious lesion involves the lingual wall, which it rarely does in the incipient stages, this wall cannot be left standing as illustrated. When the lingual wall can be left standing, a resistance form is placed in the line angle in dentin between the lingual wall and the axial wall from the incisal retention form to the linguo-axiogingival retention form. Thus the lingual wall in reality is analogous to the gingival seat of a cavity prepared in an upper anterior tooth.

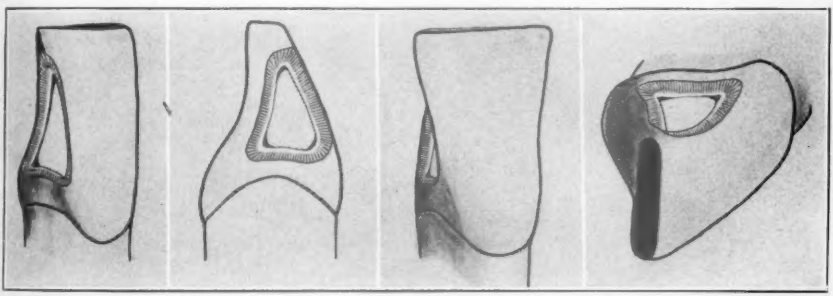

Fig. 4.—Four aspects of cavity, including contact point, in lower central incisor.

appearance is of little consequence. In this illustration, the contact point is at the incisal edge, and were this cavity to include the contact point, an entirely different restoration would be necessary.

Figure 3, B, is a proximal aspect of the cavity. This figure illustrates the position of the retentive resistance forms. The incisal retention form is not made in dentin beneath the labial plate as advocated in the upper anterior cavity. Instead, the incisal retention form is made in dentin behind the labial plate of enamel, but directed toward the lingual and incisal aspects. The reason for directing the incisal retention in dentin toward the lingual aspect is that it is readily ac-

Figure 3, D, illustrates an incisal aspect of the prepared cavity and shows the labio-axiogingival retention form. With the lingual wall intact, this is a very difficult form to make with a bur; but it is possible to start the retention form by holding an inverted cone bur at right angles to the axial wall. Therefore, it is prepared not so much as a retention form, as it is as a resistance form, with hand instruments, and if it is not accessible for condensation, it can be omitted, since the cavity has fundamentally the same retention as a buccal or labial cavity, between the incisal retention and the linguo-axiogingival retention. Because the lower anterior

teeth from an incisal aspect have a geometric outline resembling a rectangle, caution should be used in preparing the linguo-axiogingival retention. The retention form should be directed lingually toward the cingulum and downward, to avoid embarrassment of the pulp.

Figure 4 illustrates four aspects of a prepared mesial cavity which includes the contact on a lower central incisor.

Figure 4, A, B, C and D, is practically the same as Figure 3, A, B, C and D, with this exception that the illustrations in Figure 4 show a cavity involving the contact point. This cavity is ideal and it is preferred when its preparation does not weaken the incisal angle. This cavity can usually be prepared in younger patients, whose lower anterior teeth have not suffered attrition, abrasion or erosion of the incisal edge. If a cavity on the distal surface of a lower lateral incisor involves the lingual wall extensively, and if the operator is without the facilities of a right angle electropneumatic condenser, better service can be rendered to the patient by preparing a cavity with incisal access.

In cavities in the distal surfaces of the upper and lower cuspid teeth, again the primary requisite for filling with gold foil is access. However, two types of cavity preparation for the upper cuspid are recognized, the choice depending upon the position of the cuspid with respect to the arch outline form. In both types of cavity preparation, it is permissible to be extravagant in the amount of gold displayed because the gold is usually hidden on the distal surface of the cuspid by the lip, being visible only in profile. One type of cavity for the distal surface of a cuspid is spoken of as the labial access cavity, the other type as the linguo-incisal access cavity.

Figure 5 illustrates four aspects of a prepared distal cavity on an upper cuspid incisor of the linguo-incisal access type. This linguo-incisal access type of cavity for the distal surface of an upper cuspid is advocated principally for a cuspid that has a labial protrusion or one in which the distal surface happens to be rotated labially.

Figure 5, A, is a labial aspect of such a prepared cavity. While the labial outline is parallel to the long axis of the tooth in this illustration, it is also possible to prepare the labial outline so that it converges markedly toward the median line through the long axis of the tooth. This type of cavity always involves the distal incisal angle of the tooth, and should the distal arm of the cuspid be involved in lateral excursions, the distal incisal angle should be overbeveled in order to protect the enamel rods at this margin from undue slicing stresses of mastication. The extent of the converging of the labial outline toward the median long axis and also the beveling of the incisal angle are governed by the

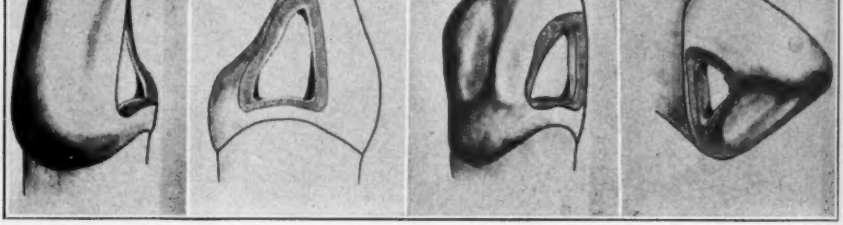

Fig. 5.—Four aspects of linguo-incisal access type of cavity for distal surface of upper cuspid.

access that will be needed in filling the cavity.

Figure 5, B, illustrates a proximal aspect of the completed cavity, showing the position of the retention forms and resistance forms. Because of the bulk of dentin beneath the cingulum, the linguo-axiogingival retention outlines can be carefully made in dentin with less probability of embarrassing the pulp and undermining the lingual axial wall. There is left standing a short lingual axial wall which, in many respects, is similar to the lingual axial wall of a prepared posterior tooth cavity with the exception that the cuspid has no lingual cusp. The labio-axiogingival retention is facilitated because of the same considerations. However, it is the labio-axio-gingival retention form that is drawn incisally as a line angle resistance form to the labio-incisal retention form. In this respect, this linguo-incisal access type of cavity differs from other proximal cavities on upper anterior teeth. The labio-incisal retention form can be prepared with a small inverted cone bur in a contra-angle handpiece. This labio-incisal retention form can be further emphasized by means of the right angle hatchet No. 3-1-28 so that it acts as a resistance form as well as in retention.

Figure 5, C, illustrates a proximo-lingual aspect of the linguo-incisal access type of cavity on the distal surface of an upper cuspid, showing the lingual wall cut back to permit access to the resistance form running from the labio-axio gingival retention point as a line angle in dentin to the labio-incisal retention point. While the gingival seat is prepared as a flat plane or a plane following the curvature of the cervical line, it is extended labiolingually to place the gold enamel margins in freely cleansed areas and is beveled and finished as is any other upper anterior cavity. The extension of the cavity gingivally differs slightly on the distal surface of an upper cuspid from the extension gingivally on upper anterior teeth because, frequently, the distal surface of a cuspid is markedly bell-shaped with a protruding distal contact point. Hence, it is frequently desirable to extend the cavity gingivally to a point where contact with the adjacent bicuspid is freed, which may not be under the free gum margin. This exception is made only when the caries is incipient and the position of the tooth gives linguo-incisal access.

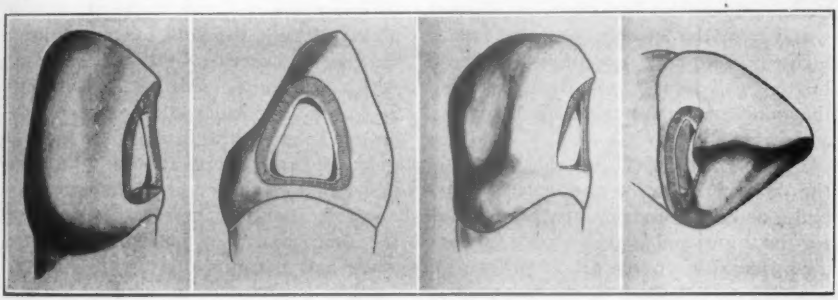

Fig. 6.—Four aspects of labial access type of cavity for distal surface of cuspids.

Figure 5, D, illustrates a proximo-incisal aspect of the prepared cavity. The free access to the gingival seat is afforded by the labial outline converging toward the median axis line and the overbeveling of the linguo-incisal area of the tooth. One of the advantages of the linguo-incisal access type of cavity is that if, in preparing this cavity for gold foil, the operator finds caries so extensive that gold foil is contraindicated, the cavity

can be readily converted to a distolingual inlay cavity with the customary dovetail form on the lingual surface.

Figure 6 shows four aspects of a cavity prepared for the distal surfaces of cuspids, which is spoken of as the labial access type of cavity.

This type of cavity is used frequently on the distal surface of lower cuspids, although it can be used on upper cuspids in a position in the arch perpendicular to the occlusal plane or in lingual version. Likewise, the linguo-incisal access type of cavity can be used in lower cuspids when the anatomic position of the cuspid tooth with relation to the other teeth permits. Fundamentally, the labial access type of cavity for the distal surface of cuspids bears a similarity to the cavity preparation described in Figures 3 and 4 for the lower central and lateral incisors, with the exception that the lingual wall is cut back for access and the double bevel at the incisal angle is advocated.

Figure 6, A, B, C and D, illustrates the incorporation of the several principles described under cavity preparation for the upper and lower anterior incisors. The extension on the labial surface for access is as described in the lower anterior incisor cavity preparation. Thus, it is apparent that when an operator is preparing a cavity with labial access on the distal surfaces of cuspids, he must have a thorough working knowledge of all the principles of gold foil cavity preparation and the ability to use these principles as the case at hand demands.

The principles that have been presented herewith are not infallible and they are not presented for argumentative purposes. Compromises will be necessary occasionally. The upper lateral incisor that has been undergoing a retrogressive change frequently challenges these principles and the ingenuity of the operator. In any deep cavity where the axial wall is thin and the pulp is large, as in youth, an oxyphosphate of zinc filling is indicated to permit recession of the pulp and the formation of secondary dentin before insertion of gold foil.

It is the purpose of the teaching staff of the Division of Operative Dentistry at the University of Minnesota to present principles of gold foil cavity preparation that are basically sound and yet practical enough for the man of average ability. Truly, the gold foil cavity preparation is exacting and requires skill, which is acquired only by perseverance. It is our contention that once an operator masters the basic principles of gold foil cavity preparation and the principles of annealing and condensation, he acquires a sense of perspective regarding the adaptability of gold foil to cavity walls and margins that is an incentive for him to continue to use gold foil as a filling material.

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ORAL MANIFESTATIONS OF BISMUTH THERAPY IN THE TREATMENT OF SYPHILIS

By MILLARD R. DEAN, D.D.S., Washington, D. C.

THE rôle of the dentist in the prevention and treatment of syphilis has been limited to the recognition of possible Hutchinson's[1] teeth and mulberry molars and the diagnosis of mucous patches[2] in the soft palate. The recent trend in the treatment of syphilis by alternative medicines, consisting mainly of injections of neo-arsphenamine in the arm and bismuth compounds in the hip, has resulted in noticeable dental defects. These oral manifestations have occurred during the use of bismuth in solution. At first appearance, they suggest mercury or lead poisoning.

The prevalence of pigmentation in the mouths of patients referred to the dental clinic of the Southwest Health Center of the Health Department, Washington, D. C., by the Venereal Disease Clinic indicates that more attention should be given to oral conditions. Most of the patients seen in the clinic were from the indigent class, having been certified by the medical social service worker as eligible for free service. The ill-effects of the bismuth blue line are two-fold: the personal appearance of the patient is marred by this pigmentation, which causes him to endeavor to conceal his gums, and, physiologically, the venous circulation is retarded, with resultant bleeding from the gums and acceleration of the deposition of dental calculus.

Solis-Cohen and Githens (1928)[3] recorded the use of tartrobismuthate of sodium and potassium by Sazerac and Levaditi in 1921 as a remedy for syphilis. The *Journal of the American Medical Association* (1923)[4] was one of the first periodicals to mention the injurious effects of bismuth treatment, bringing out the fact that physicians should observe beginning stomatitis. Hudelo, Clement-Simon and Richon (1923),[5] of Paris, made a similar reference to bismuth stomatitis associated with the use of bismuth together with arsenic, in the treatment of syphilis. The cleansing of the mouth and teeth in bismuth treatment was introduced by Pietkiewicz, Paris, in 1926.[6] He stated that infected dental roots, caries and calculi would cause physicians to interrupt necessary treatment, and yet they would not insist that the mouth of the patient be properly treated. One of the methods employed by Pietkiewicz is brushing of the teeth and gums with a hard brush and castile soap for three minutes in the morning, and, in the evening, brushing them with a combination of sodium borate (borax), 10 gm., potassium chlorate, calcium carbonate and magnesium carbonate, 30 gm. each, and menthol, 0.5 gm. The presence of salivary or serumal (green) calculus on poorly cared for teeth was mentioned.

The outpatient department of the University of Georgia Medical Department in 1933[7] published statistics covering thirty-six cases of bismuth poisoning and thirty cases of bismuth stomatitis. Those patients with bismuth stomatitis had carious teeth, but the use of bismuth could be continued after the extraction of these teeth. Another method of treatment was introduced by Gerson (1934),[8]

From the Dental Clinic, Southwest Health Center, Health Department of the District of Columbia.

whereby the mouth is washed three times daily with soap and water and the teeth are cleaned with a moderately hard brush. He also directed that the patient hold in the mouth eight 3-mg. acriflavine hydrochloride tablets in the course of a day. McCarthy and Smith (1935)[9] stated that approximately 80 per cent of 511 dentulous patients who were receiving intramusclar injections of bismuth salicylate had pigmentary lesions of the oral cavity. Among patients without teeth, the incidence was low (9 per cent) and the lesions were mild in character. Pigmentation of the buccal mucosa was present in the acute cases. The accumulation of calculus, associated with gingivitis, was the predisposing factor in the poisoning. In 1936, Arias and Mazzini, of Buenos Aires,[10] stated that the use of bismuth is contraindicated if the mouth is in bad condition. The foregoing references were all contributed by physicians.

The injection of bismuth caused bluish spots in the interproximal tissue, gradually spreading around the lingual border until the tooth was completely encircled. Other manifestations are puffiness of the gum tissue, marked tendency to bleed, collection of serumal calculus and salivary calculus, sordes and fetid breath. In acute, prolonged cases, there may be loosening of the teeth. The bismuth blue line is first noticeable around the lingual border of the lower anterior teeth, owing to the lowered resistance of this area to collection of calculus. Calculus is present here, first, because the glands on the floor of the mouth empty into this area and, second, because patients do not thoroughly brush the lingual surfaces. The next most frequent site is the lingual border of the lower second and third molars. Then the discoloration appears in the upper posterior buccal region of the teeth, owing to the fact that the gland duct empties into that area. Associated with the bismuth gingivitis is a lack of oral hygiene and a low general physical condition.[11]

Routine dental service rendered by the clinicians of the Washington, D. C. Health Department include scaling and polishing of the teeth, prophylactic treatment for pyorrhea, fillings (amalgam and synthetic) and extractions. Several of the patients with bismuth stomatitis showed marked improvement after dental treatment. Others receiving bismuth injections had their treatments discontinued upon the appearance of the bismuth blue line.

Therefore, test cases were selected for partial scaling and treating of one side of the mouth, while the other side was left as a control. During dental treatment, the bismuth injections were continued, in some cases. In other cases, the bismuth treatments had been completed by the physician for that period of time. In still other cases, the patient had been dismissed from the venereal disease clinic as entirely cured. The return of slightly blue spots in the three groups treated was noted as always occurring in the interproximal gum tissue, where, on investigation, there were found to be serumal calculus deposits or sordes, indicating that the patient must continue to brush the teeth properly and massage the gums. The digestive reactions of the patients also were noted, and if sluggishness of the bowels was present, a mild cathartic, usually magnesium citrate or sulfate, was advised. This experiment in scaling the teeth and treating the mouths of patients convinced me that the main factor in preventing bismuth pigmentation is cleanliness of the mouth and a continued high standard of oral hygiene.

Bismuth, in its metallic form, is a white crystalline substance belonging chemically to the same group as vanadium, and, in its medicinal effects, resembling lead and, to a less extent, mercury. The potassium bismuth tartrate oil solution, containing from 64 to

69 per cent of bismuth, is usually employed for intramuscular injection, into the gluteal muscle, in the treatment of syphilis. Doses range from 1½ to 3 grains, injected usually in from 1 to 2 cc. solutions of a sterile vegetable oil once a week for from eight to ten weeks. The oil solution has been found to be the best form because the bismuth is held in suspension in the muscular area and is gradually absorbed by the cells. The soluble salts of bismuth suspended in oil remain in the tissues at the site of the injection for a period ranging from two to six weeks before they are completely absorbed.

Injections of solutions of bismuth compounds in water have been used in the treatment of syphilis and their administration has been found to be less painful and to result in more rapid absorption by the tissues. Inasmuch as the drug in aqueous solution is excreted more rapidly, it is necessary to make the injections more frequently to insure its presence in the blood stream at all times.

The bismuth is absorbed from the muscle depots and circulates within the body in the form of a soluble salt, which, upon contact with the hydrogen sulfide formed about the teeth as the result of the decomposition of food, forms bismuth sulfide. When this bismuth sulfide (Bi_2S_3) is deposited about the margin of the gums, a blue discoloration results. Because of the heaviness of the metal, the bismuth compound lodges in the small capillary veins and slows up the venous circulation.

In an effort to determine the composition of the blue pigmentation, x-ray studies were made and chemical analysis and microscopic data were sought. The drug used in the treatment was bismuth subsalicylate in olive oil. This is apparent on x-ray films as a shadow, visible the second day and gradually disappearing in three or four days, according to investigations of Solis-Cohen and Githens, recorded by Muller in "Pharmaco-Therapeutics." Also, the carbonates or the subcarbonates of bismuth are x-ray active and are used extensively in intestinal diagnosis.

In the normal x-ray examination using radiotized films and three-second exposure with a low KVP. and a 10 mm. objective, no bismuth line was visible. Further tests to show the presence of the bismuth in the gum tissues were made immediately after the extraction of an upper anterior tooth completely encircled by gum tissue with bismuth pigmentation. To distinguish the soft tissue, the target was placed 36 inches away from the extra-fast dental film; but no sign of the bismuth compounds was present. This would indicate that the bismuth in the tissue was not in the form of a carbonate radical. However, failure to disclose the presence of bismuth on the x-ray film may also be due to the relatively small amount of metal present in the blue gum line.

In the opinion of Lloyd H. Newman, M.D., Ph.D., assistant professor of biochemistry, Howard University Medical College, Washington, D. C., determination of the exact form in which the bismuth is found in the tissues would entail considerable difficulties. First, in whatever form it is, it would, for chemical analysis, be necessary to dissolve it. This process would require the use of some such acid as nitric acid,[12] to remove the primary negative radical, if present. Whether the primary form is a metallic bismuth or a bismuth sulfide, the acid treatment would change it to the soluble bismuth nitrate. In the event that the presence of the sulfide could be proved, the question would be raised as to its possible presence as a product of the organic sulfur in the form of cystin and methionine, possibly containing amino acids, found in adequate protein substances.

Robert S. Jason, M.D., Ph.D., professor of pathology, Howard University Medical College, furnished data from

the microscopic examination of the bismuth infiltrated tissue. Histologically, the slide revealed superficial black deposits in the squamous epithelial cells as well as deposits in the deeper connective tissue. The nature of the pigment was not apparent.

The treatment in the clinic was initiated after a thorough understanding with the patients that their cooperation would be necessary to achieve favorable results, since only part of the treatment is performed by the dentist. The first step in that treatment was a thorough examination to disclose collections of food or greenish stain deposits in and around the teeth. This examination presents a good picture of the home care practiced by the patient. Second, the presence of serumal and salivary calculi on the teeth was noted. Third, the extent of caries on the gingival and occlusal surfaces of the teeth and the number of extractions needed or teeth missing was determined.

Prophylactic measures should be started with the first visit of the patient, even if there is an acute pyorrheic condition with discharge of pus. Scaling of the lower anterior teeth is usually the prophylactic measure on the first visit. At this time, the patient should be advised as to the proper toothbrushing technic; that is, to brush the teeth three times daily with a very stiff bristle toothbrush. He is instructed to massage the gums with the index finger six or eight times a day, pressing firmly on the tissues and stroking them, but not more than three or four times. The dentist should be certain that the patient understands that he is not to rub the gum tissues, as this will result in sloughing, a more painful condition. During subsequent visits, scaling of the lower posterior teeth should be carried out and a recheck be made for the presence of calculi on the lower anterior teeth. It is advisable that from four days to a week elapse between the first and second visits. During the interval, the patient will notice some disappearance of the blue line pigmentation and, in most cases, he is more interested and willing to continue cooperation with the dentist. These scaling operations should be continued until the entire mouth is thoroughly cleaned. The time required for the prophylactic measures becomes less important as the improvement gains the confidence of the patient.

Pietkiewicz's prescription, mentioned above, was followed by a limited number of clinical patients and the results compared favorably with those obtained by patients who used sodium perborate powder on the toothbrush and as a mouthwash. Equally favorable results were obtained by patients who only brushed their teeth with a stiff bristle brush and salt or sodium bicarbonate. The latter agents were used because it was not practicable to furnish tooth powder and a mouthwash to all of the clinical patients.

REPORT OF CASES

CASE 1.—A colored woman, aged 34, entered the clinic September 1941, with a history of ten bismuth injections and four neoarsphenamine injections in 1934. She was observed in the dental clinic October 31, 1941, after receiving four hip injections of from 2 to 3 grains per cubic centimeter of bismuth subsalicylate in olive oil. The general mouth condition was fair, with a definite, deepened bismuth pigmentation around the lower anterior and molar teeth and the beginning of discoloration in the upper posterior lingual region. Noticeable deposits of serumal and salivary calculi were evident. The patient had an ill-fitting upper anterior gold crown. The lower anterior teeth were scaled October 13. October 16, these teeth were rescaled and prophylactic measures were continued on the left side of the mouth posteriorly. October 20, all the lower teeth were scaled. Marked improvement in tone of the gum tissue, with only a faint bismuth (blue) line, was observed on the third visit. The three visits extended over a week. The upper teeth were scaled October 22 and

small deposits of serumal calculi were removed from the area where slight pigmentation was noted. These deposits were found at the pigmented spots in each instance. The teeth were given a final cleaning and polishing October 27 and, when the case was last seen, December 1, slight pigmentation was apparent around the lower anterior teeth. There was sordes in the interproximal gum areas, indicating a lack of home co-operation by the patient. Bismuth subsalicylate was continuously administered during the course of the prophylactic measures, but only a very faint blue line was apparent.

CASE 2.—A colored woman, aged 37, admitted to the clinic July 7, 1941, with diagnosis of latent syphilis, gave a history of antisyphilitic injections as far back as 1920. She had first received bismuth in 1938, with continuous treatment, at intervals with arsenic compounds, through 1940. The patient completed a series of ten bismuth subsalicylate treatments August 25, 1941, followed by two arm injections of mapharsen, with a return to 1 cc. bismuth injections, October 6, 13 and 20. She was dismissed from the venereal disease clinic as cured, October 20. Dental examination, August 16, 1941, revealed a very definite thickened bismuth (blue) line and a slight infiltration of pigment in the buccal mucosa. Gingivitis was present, but only very hard and tenacious deposits of serumal calculus were observed. There were two badly decayed teeth and other teeth in need of fillings. Extractions and fillings were completed September 22. The lower teeth were first scaled September 29 and rescaled October 6. The following week, the teeth were all scaled and polished. In this three-week period, only the lower anterior teeth showed no indication of pigmentation. The patient returned for observation November 6, and the bismuth line was evident on the lower posterior teeth. Three scaling operations were necessary before the gingivitis resulting from the bismuth treatment for syphilis was relieved in the lower posterior teeth. The patient is now cooperating satisfactorily and has used a stiff bristle brush as first advised.

CASE 3.—A colored woman, aged 22, admitted to the clinic September 6, 1940, with a positive Wassermann reaction and a diagnosis of latent syphilis, had received eighteen bismuth injections in the hip and fifteen neo-arsphenamine injections in the arm during 1940 and to March 19, 1941. Clinical treatment for the venereal disease began July 10, 1941. Eight neo-arsphenamine injections had been given. Bismuth subsalicylate in 1 cc. doses was administered for eight weeks through October 30, 1941. Dental examination, July 24, 1941, revealed six dental cavities and chronic pyorrhea with large salivary calculi present. A prominent bismuth (blue) line completely encircled each lower tooth and was present in the lingual area of the upper teeth. Spot scaling, begun July 24 and continued August 7 and 21, was limited to the lower left side only, the right mandibular area serving as a control. Such remarkable results were obtained in the area where prophylactic measures were observed that it was necessary to scale the labial and buccal surfaces of the right side to effect a uniform appearance. Fillings were inserted October 10 and 17 and November 17. It was necessary to spot scale the lower left molar area October 21, and again November 10. When last seen, the patient showed a normal pink gum line. Lack of materials for home prophylaxis may lead to the return of the bismuth stomatitis.

SUMMARY

In a majority of cases, there were definite oral manifestations the result of bismuth therapy prescribed in the Venereal Disease Clinic of the Southwest Health Center, Washington, D. C., Health Department, with an estimated 700 patients receiving bismuth injections in the hip weekly in the treatment of syphilis. The dark line on the gums and other symptoms such as bleeding of the gums, excessive salivation, a bad odor of the breath, puffing and swelling of the gum tissue and occasional loosening of the teeth, were seen in the mouths of most of the patients receiving the bismuth treatments. Such oral conditions have been referred to as bismuth stomatitis, bismuth gingivitis, bismuth pigmentation, bismuth poisoning or the bismuth blue line.

The general dental services rendered by the District of Columbia Health De-

partment clinicians consisted of scaling and polishing of the teeth, treatment of the gums, placing of amalgam and synthetic porcelain fillings and extractions. These services resulted in such marked improvement in the mouths of the patients that test cases were selected for study. The test cases were developed by administering the general dental service on one-half of the lower jaw of patients showing symptoms of bismuth stomatitis. The other half of the lower jaw was not treated and so served as a control. Experiments were made and records kept of (1) patients receiving injections of bismuth subsalicylate in olive oil in doses of 2 or 3 grains per cubic centimeter; (2) patients whose bismuth treatments had been interrupted for a period of from two to six weeks; (3) patients whose treatments for syphilis had been completed and who had been released as cured, and (4) patients who had had the mouth put in normal condition before they received bismuth treatment for syphilis. In a majority of cases, favorable results were obtained in each of the four groups mentioned above, indicating that the dentist can help materially in the treatment of syphilis. Specific recommendations were made to the patients regarding home care of the mouth, such as the use of a hard bristle toothbrush at least twice daily, massage of the gums with the fingertips at regular intervals throughout the day and the use of a mouthwash.

X-ray, chemical and histologic analyses of the black deposit in the gum tissue were made to determine the composition of the bismuth pigmentation. It was agreed that the deposit is probably bismuth sulfide, resulting from the presence of sulfur in the mouth, due to the decomposition of food and the presence of the element sulfur in the body cells.

A review of medical and dental literature disclosed a dearth of publications by dentists, and those treatises written by physicians recommended either the suspension of the bismuth injections or the cleansing of the mouth by the dentist during administration of the bismuth.

CONCLUSIONS

1. The dentist should be a part of an organized, well-planned service for patients receiving injections of bismuth compounds in the treatment of syphilis. Dental service should include prophylactic measures, such as scaling and polishing of the teeth; treatment of the gums; filling, extracting and replacement of teeth, and the establishment in the patients' mouths of a healthy, normal condition.

2. The patient should be instructed as to the use of a hard-bristled toothbrush, the technic of massaging the gums and the rinsing of the mouth with a suitable mouthwash so as to maintain a hygienic condition of the oral cavity.

3. It is not necessary to interrupt or to discontinue the use of the bismuth solution in the treatment of syphilis if adequate dental service is administered before or during the period of injections.

4. The elimination of the bismuth pigmentation by the dentist improves the appearance of the patient and, as the result, the latter cooperates not only with the dentist, but also with the physician, who is thus enabled to continue the bismuth injections in the treatment of syphilis.

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IDEAL STRESSBREAKING FOR PARTIAL DENTURES

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INTRODUCTION

THE field of partial denture construction presents numerous complicated problems that have challenged the ingenuity of some of the finest minds in dentistry. Many outstanding men have devoted their best talents to the study and solution of these problems and have contributed materially to the progress that we have made in this field. Their efforts have brought about such a tremendous improvement in partial denture construction during the last twenty-five years that we can hardly compare its crude beginnings with present day results and are astounded at the enormous changes.

It is a far cry from the time when Nesbitt first applied the casting process to this field in 1916[1] to the beautiful results obtained today with greatly improved designs and materials. It is a long step from the simplicity of the one-piece casting technic for removable bridges, first presented in a clinic before the Midwinter Meeting of the Chicago Dental Society, January 25, 1919, almost twenty-four years ago,[2] to the complexities and refinements of the present-day construction methods. Concomitant with these technical advances, we also have acquired a better understanding of the physiologic principles involved in maintaining teeth and their investing tissues in healthy condition under partial dentures, as well as of the pathologic processes that arise in consequence of our failure to do so. Indeed, we may well be proud of the progress that we have made during the past generation.

Read at the Greater New York Dental Meeting, December 8, 1942.

PARTIAL DENTURES

On the whole, this progress has been empiric rather than scientific. In its very nature, partial denture construction does not readily lend itself to scientific methods of study. There are many reasons for this, such as the infinite variety of patients, their different states of health, the multitudinous methods of treatment and construction available to us and the great length of time—usually many years—of periodic observation needed, both clinically and roentgenographically, before scientific conclusions can be drawn from a sufficiently large number of cases. Last, but not least, there remains the difficulty, if not impossibility, of obtain-

ing an adequate number of control cases, needed to check the results of one method of treatment against those of others, or of no treatment at all. All these factors combined seem to preclude the likelihood of obtaining data based on really scientific methods of study, comparable with those commonly employed in other fields of dentistry. While some scientific work has been done on partial dentures, this has been the exception rather than the rule. However, when success in this field is measured by our ability to have restorations function over periods of ten, fifteen or even twenty years, without damage to the remaining teeth and their investing tissues, it must be clear that our work is really based upon practical experience and not upon methods that can be called truly scientific.

This explains why we have, with few exceptions, improved our work largely through the trial and error method, and as the result of clinical experience gained in daily practice. Since there are more than 65,000 different partial denture possibilities in each jaw, according to Cummer,[3] it is obvious that our personal opinions must be the result of experience with only a small fraction of this number. Neurohr goes even farther, and after calculating that there are nearly two quintillion partial denture possibilities, frankly admits that in his treatment he is "working by 'feel' acquired by experience"![4] This is especially apparent when we keep in mind the fact that our method of treatment is influenced, usually to a large extent, by financial considerations and the psychologic peculiarities of the individual patient.[5] We must also remember that while each case could have been treated differently, with innumerable variations in design and construction, we have absolutely no certainty as to what the comparable results might have been in that particular instance.

This accounts largely for the many conflicting opinions about nearly every phase of partial denture construction, expressed freely in the literature and presented by their authors with much emphasis, but often with so little evidence that the reader becomes confused and bewildered. We can still remember the bitter controversies that have raged in years gone by, about precision attachments, cast clasps and one-piece castings, to mention only a few, and having participated in some of these debates with youthful vehemence, I can now look back after all these years and reflect with some mellowness that probably there was merit on both sides of each issue. As a rule, these men, in all sincerity, believed their opinions *ipso facto* sufficient to warrant the conclusions presented, little realizing that their views were valid only in proportion to the number of cases in which other men could find them applicable and successful, and that, until they were verified by others, their statements should be looked upon as merely the personal expressions of one individual. A lifetime of experience in this field has taught me that the truth usually lies somewhere between the two extremes, and that no conclusion should *a priori* be considered final until it has stood the test of time. Nor has any one a monopoly on knowledge.

STRESSBREAKERS

After these preliminary remarks, we can examine the subject of stressbreakers in partial denture construction and contemplate with equanimity the contradictory opinions expressed about them by various authors. For instance, Kennedy believes that stressbreakers generally do not live up to their name, for "when they reach the end of their movement against the stop, the strain is applied to the abutment teeth the same as though there was no stressbreaker."[6] On the other hand, Schwartz writes "Stressbreakers, where indicated, are of definite importance as a mechanical feature to

ease the burden imposed on abutment teeth adjoining continuous edentulous areas."[7] While these two views seem to be mutually exclusive, we can well understand how, starting from different premises, both authors may have felt fully justified by their individual experiences in drawing their conclusions. Realizing this impels us all the more to present our own views with humility, because of the limitation of time and experience on which they are necessarily based.

There is no need here to give a complete résumé of the different types of stressbreakers, past and present. This has already been ably done by Kennedy,[8] Jones,[9] McLean,[10, 11] Granger,[12] Doskow[13] and others. It is the purpose of this paper only to present in detail a method of stressbreaking for extension saddle cases that has proved of unfailing merit in my experience and that of many others.

In order to have a better understanding of the subject matter, it would be well to define the two principal terms to be used. By extension saddles, we mean the saddles needed to replace edentulous areas distally from the abutment teeth. Stressbreaking means just what the word says, the breaking of the stress on the abutment teeth. It does not mean the complete equalization of the stress, and while the effect of all stressbreaking should be a better distribution of stress, it does not follow by any means that this should result *per se* in an equal distribution of the stress between the abutments and the saddles. At this point, it might be well to quote Weaver[14]:

> All removable restorations should be both tissue and tooth bearing, allowing the tissue-bearing surface to carry as much of the load as possible under mastication. The abutments should act more as stabilizers, carrying as little stress as possible.

If we are to attain ideal stressbreaking, we must see to it that the abutments shall bear only the vertical and lateral stresses that properly should fall on them during mastication, and that they shall be relieved of all distal torque or leverage exerted by the saddles during function. At the same time, the saddles should carry the masticatory load exerted directly against them and equitably distribute this over the entire saddle areas, without being hampered by their physical connection with the abutments. In addition, the abutments should be protected against undue vertical movement of the saddles, which would tend to irritate the adjoining soft tissues and cause excessive resorption of bone. Finally, the case should resume its normal position when relieved from masticating pressure, be strong enough to withstand normal function without breakage and give esthetic results. It seems to me that these are all the requirements which could reasonably be demanded from an ideal stressbreaking method, and I believe that the one I am about to present meets all of them.

TECHNIC

The method employs a stressbreaker for lower cases and an entirely different one for upper cases. These two attachments, which, by the way, are not patented, were developed by L. M. Farnum, of Chicago, an eminent dental technician and research worker, who has used this technic successfully for many years. While this method is therefore by no means new, a detailed description of it has never before been presented in the literature.[15]

In order to present the successive steps in various stressbreaking restorations, I shall describe three typical cases, which cover the principal classifications encountered most frequently in actual practice.

LINGUAL BAR CASE

The first one is a lower case in which all the posterior teeth distally from the two cuspids have been lost (Kennedy,

Class 1). (Fig. 1.) I shall assume that preliminary models and roentgenograms have been made and studied and that the case has been diagnosed and properly outlined. I start with good plaster impressions of both upper and lower jaws and, after the pieces are broken out, I permit them to surface-dry overnight, exposed to the air. Plaster is preferred to other impression materials, because it permits the use of accurate metal models. The next day, the impressions are assembled and a lower master model and an upper articulating model of a good low-fusing metal, which should be free

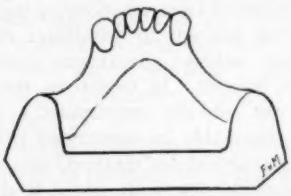

Fig. 1.—Lower case. All posterior teeth distally from the cuspids have been lost.

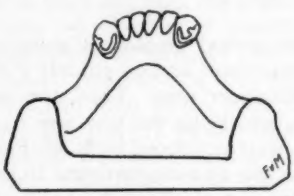

Fig. 2.—Two cuspid clasps in position.

from volumetric changes upon cooling, are poured.

It should be made clear at this point that, for the purpose of this technic, it makes no difference whatsoever whether the case is to be retained by means of clasps or by precision attachments. Since these stressbreakers can be used with equal facility and success with either method of retention, the decision in this matter lies entirely with the individual dentist. However, for my description of this technic, I have chosen one method, calling for the use of clasps. Of course, precision attachments, if used, must be incorporated in the metal master model before we can proceed.

It should also be pointed out that this stressbreaking method is feasible only with an all-gold construction in lower cases, but lends itself with some modifications to a combination of gold and other materials in upper cases. At all times throughout this work, the best materials available for the purpose should be used, if durability and freedom from breakage is desired.

First, a clasp is constructed for each cuspid, either by casting or by a combination of casting and the use of bent wire, as the particular shape and position of each abutment may require. (Fig. 2.)

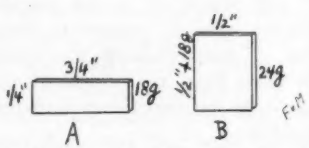

Fig. 3.—Both parts of lower stressbreaker.

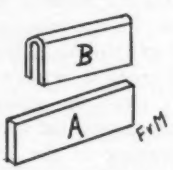

Fig. 4.—Parts A and B; showing that latter is formed to fit over former.

In making the lower stressbreaker, two rectangular flat strips of hard clasp metal plate are used; one, 18 gage, three-quarters inch long and one-quarter inch wide (Fig. 3, A) and the other piece, 24 gage and almost square, one-half inch long, and one-half inch plus 18 gage in width, (Fig. 3, B). The second piece (B) is formed so that it folds tightly over the first one (A) (Fig. 4) and covers both sides of it with an outer layer of clasp metal. This will give a length of metal (Fig. 5) one-quarter by three-quarters inch, consisting of three layers, i.e., two outer layers one-half inch long, hereafter called the fe-

male part (Fig. 5, B), and one inner layer, hereafter called the male part (Fig. 5, A), which extends one-quarter inch beyond the female part.

This combined strip, with the male part facing toward the gingival aspect, is placed in a vertical position distally from the cuspid clasp or precision attachment, and parallel with, but slightly lingually from the crest of the ridge. (Fig. 6.) Both parts of the stressbreaker are

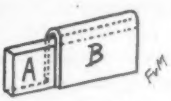

Fig. 5.—Parts A and B in proper relation.

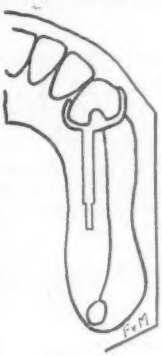

Fig. 6.—Lower stressbreaker in place distally from cuspid clasp, in vertical position, but lingually from crest of ridge.

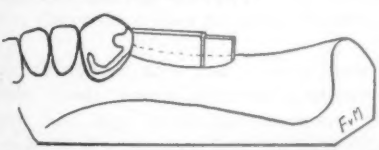

Fig. 7.—Lower stressbreaker ground to fit gingiva and soldered to distal aspect of cuspid clasp.

now ground in so as to fit the gingival area accurately.

The anterior end of the female part is closed by soldering a thin piece of clasp metal over it with 22K solder and the female part is then soldered to the distal surface of the cuspid clasp in the position stated; i.e., vertically, parallel with and slightly lingually from the crest of the ridge. (Fig. 7.) During this step, the male part is left inside the female part, but withdrawn distally one-sixteenth inch, both to preserve the fit of the female part and to prevent the solder from flowing over the male part. The same procedure is then followed for the opposite side, because the technic is identical for the two sides of the case.

A lingual bar is now waxed up and cast, the terminals covering the entire

Fig. 8.—Lingual bar terminating in two plates, which cover lingual surfaces of both female parts.

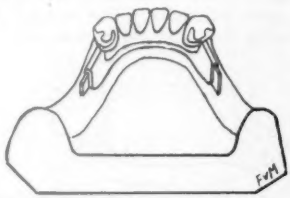

Fig. 9.—Lingual bar soldered to lingual surfaces of both female parts.

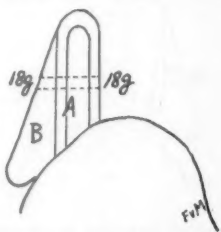

Fig. 10.—Eighteen gage hole drilled through stressbreaker (A) and lingual bar (B), from buccal to lingual aspect, halfway between gingival and occlusal aspect.

lingual surfaces of both female parts and extending somewhat below them. (Fig. 8.) This bar is then soldered to both these surfaces (Fig. 9), and finished so that they present a smooth appearance.

The next step is to drill a small hole, 18 gage, buccolingually through the en-

tire thickness of the stressbreaker as well as through the lingual bar. This hole is placed very close to the clasp and halfway between the gingival and the occlusal edges of the attachment. (Fig. 10.) With a pair of dividers and the hole as the center, an arc is scribed on both the buccal and lingual plates of the stressbreaker. (Fig. 11.) The radius of this arc is the length of the female part and the arc runs the entire vertical height of the attachment. The surplus of the female part extending distally beyond this arc is then removed, and the male part is cut off till it extends only three-sixteenths inch beyond the female part. In addition, the male part is relieved slightly at the gingival edge so as to provide space later for the saddle. (Fig. 12.) Then the hole is enlarged to 16 gage through the male and female parts and only the 18-gage hole threaded with a tap through the thickness of the lingual bar only, after which the lingual opening of the hole is countersunk and slightly grooved. (Fig. 13.)

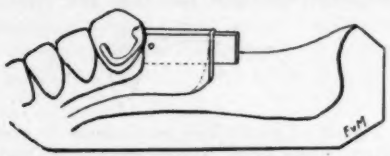

Fig. 11.—Arc scribed on buccal and lingual plates with hole as center and length of female part as radius. The surplus female part distally from the arc is removed.

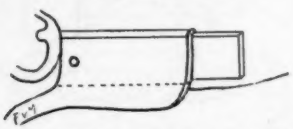

Fig. 12.—Male part slightly relieved at gingival edge to provide space later for saddle.

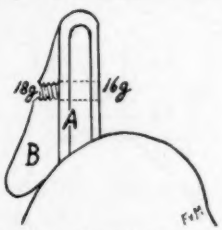

Fig. 13.—Hole enlarged to 16 gage through stressbreaker (A) and threaded with tap through lingual bar (B) only. The lingual opening is countersunk and grooved.

A piece of 16 gage, high-fusing post metal is threaded for only a short distance with a die to fit this 18-gage hole, making it in effect a gold screw. This gold screw is then tried in and the male part is trimmed at the occlusal and mesial edges and tested for clearance, to allow a downward rotation of 1 mm. at the distal end of the female part. (Fig. 14.) The gold screw is now inserted from the buccal aspect and cut off at the lingual surface, but with a small surplus projecting, which is riveted down while the screw is held in a vise, and then smoothed off and polished. This creates an axle of gold which permits the male part to rotate distally downward between the two walls of the female part. (Fig. 15.)

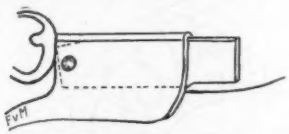

Fig. 14.—Male part trimmed at occlusal and mesial edges to allow clearance for downward rotation, after insertion of gold screw.

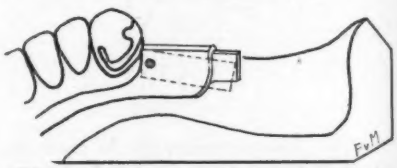

Fig. 15.—Appearance of case after riveting of gold screw. The male part can now rotate downward within the walls of the female part.

The teeth are now ground in for the saddles, so that the lingual surfaces of the bicuspid pontics fit close to the vertical wall of the stressbreaker, this allowing for a gold boxing of 18 gage thickness, and then the complete saddles are waxed up on the master model. (Fig.

16.) The area of tissue involved in the saddle design is most important and must cover at least two-thirds of the tuberosities in the retromolar areas in order to obtain proper bearing surface and prevent undue settling and cutting at the distal ends. The saddles are waxed as usual on the buccal and gingival surfaces and the exposed male parts of the stressbreakers covered, but, on the lingual surface, the wax runs only to the distal arcs of the female parts, the lingual surfaces remaining free from wax. (Fig. 16.)

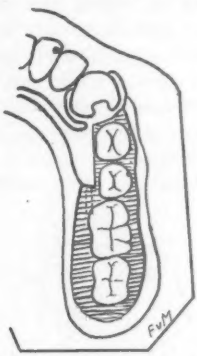

Fig. 16.—Extension saddle waxed up, covering male part, but leaving the lingual aspect of female part free from wax.

The entire assemblage, consisting of the lingual bar, two clasps and two stressbreakers, together with the wax patterns for both saddles, is now lifted off the metal model and the two wax patterns are individually drawn off distally. They are invested and cast, finished and polished, and each is fitted back separately over the exposed male part of its respective attachment. When both saddles are fitted accurately and properly seated, they are soldered to the male parts. Of course, care should be taken to antiflux the female parts, so as to prevent the solder from flowing over them and creating a fixed joint, which would preclude the free hinge motion of the attachments.

When all this has been completed, the case is ready for insertion in the mouth. We now have a lingual bar case, each saddle of which can rotate individually downward, so far as the resilience of the mucosa permits. (Fig. 17.) This rotation, which is parallel with the long axis of the alveolar ridge on each side, is obtained without any strain on the abutments, as the lingual bar and clasps assemblage, which is rigid, remains definitely seated during mastication, unaffected by the hinge motion of the saddles. Furthermore, these stressbreakers also prevent all vertical movement immediately adjacent to the abutments and thus protect them against irritation of the soft tissues and premature loss of bony support.

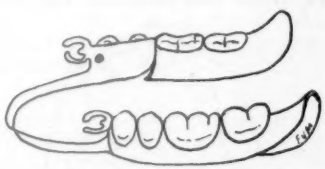

Fig. 17.—Lingual bar completed, showing only one saddle rotated downward. The lingual bar and both clasps remain stationary.

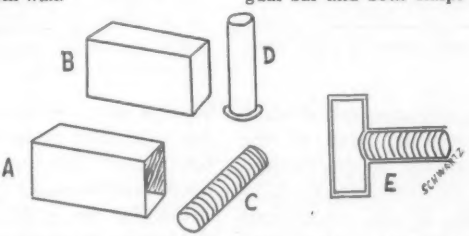

Fig. 18.—Distal extension stressbreaker available with precision attachments. A, stressbreaker box. B, stressbreaker bar. C, setscrew. D, tube. E, cross-section of assembly.

At first glance, there may seem to be a strong resemblance between the attachment just described and the distal extension stressbreaker used in connection with the conventional precision attachment or available separately for use with clasps.[16] (Fig. 18.) This extension consists of a box (A), a bar (B) which fits into it and a set screw (C) and tube (D) which holds the assemblage (E) in proper relation while permitting some rotation. The bar is soldered to the distal portion of the clasp and the box is inserted in the extension saddle, which is connected with the one on the opposite side by means of a lingual bar, care being taken that the two stressbreakers are parallel.

There is indeed some similarity between these two methods, but a little closer observation will soon reveal some important differences in favor of the former. The advantage of the method just presented by me lies, first of all, in the greater rigidity of the attachment and its resistance against lateral stresses, due to its length of one-half inch, as compared with the three-sixteenths inch length of the box and bar. Moreover, the box permits only a limited ridgewise movement, which necessarily must stop when the bar touches the bottom of the box, but the male part of the attachment described performs a true hinge movement, with a much wider range, restricted only by the resilience of the mucosa.

Secondly, by soldering the lingual bar to the female parts of the Farnum stressbreaker, we obtain a stationary lingual bar assemblage, which does not move during mastication, and therefore does not require interattachment parallelism. On the contrary, each stressbreaker moves independently of the other, and this permits each saddle to rotate parallel to the long axis of its individual ridge. This motion prevents the cutting or chafing of the mucosa, which is more likely to occur when we use the box attachment in which the two saddles must move simultaneously as one unit. This motion is particularly important in the lower jaw, where we often see ridges with considerable flare. Furthermore, masticating pressure exerted on one saddle does not cause a downward movement in the other saddle, an advantage over the other method, wherein the two sides must move at the same time, since this throws an unnecessary burden on the ridges.

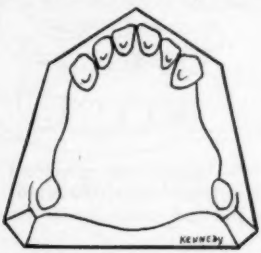

Fig. 19.—Upper case, with only six anterior teeth present.

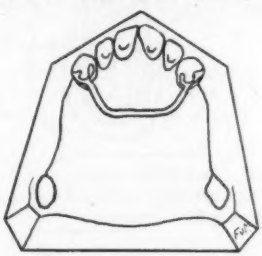

Fig. 20.—Rigid assemblage of palatal bar and two cuspid clasps.

Finally, the gold screw, penetrating the entire thickness of the Farnum attachment and securely riveted on the lingual surface, forms a much more reliable axle than a mere setscrew, which may become loosened.

PALATAL BAR CASE

In the upper jaw, the procedure, while similar to the one described for the lower, deviates in several important respects. To illustrate this, we shall take as the second example a case in which only the six upper anterior teeth are

present and bilateral extension saddles are needed (Kennedy, Class 1). (Fig. 19.) We proceed as in the lower jaw with a metal master model, and make a rigid assemblage of a palatal bar and two cuspid clasps (Fig. 20) or precision attachments, whichever the operator prefers. For obvious reasons, the upper stressbreaker should not be so bulky as the lower, and, therefore, an entirely

Fig. 21.—External lateral view of upper stressbreaker.

Fig. 22.—Lateral cross-section through upper stressbreaker. A, flat plate. B, loop fastened to A. C, round inner bar linked through B. D, outer sheath fastened to C. E, steel pin locking B, C and D in proper relation.

Fig. 23.—Upper stressbreaker rotated distally.

different attachment has been designed, about three-sixteenths inch high and one-eighth inch wide. (Fig. 21.) It is made of stiff clasp metal and consists of an 18 gage flat plate (Fig. 22, A), to which is fastened a loop. (Fig. 22, B.) Linked through this loop is a round inner bar (Fig. 22, C), which fits tightly against the flat plate (A) and is fastened to a thin outer sheath (Fig. 22, D). This round bar (C) and sheath (D) can rotate distally in hinge fashion in relation to the flat plate (A) and loop (B). (Fig. 23.) In addition to this rotation, the stressbreaker has a slight vertical movement of 0.020 inch (Fig. 24) and a very slight lateral one of 0.003 inch. This allows just sufficient play to prevent one side of the partial denture from binding when masticating pressure is applied to the opposite side, for, in the upper jaw, the two saddles neces-

Fig. 24.—Upper stressbreaker at depth of vertical movement.

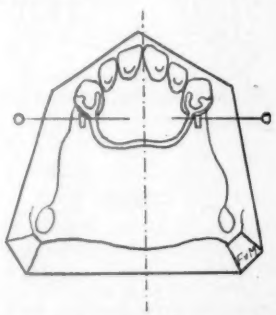

Fig. 25.—Both stressbreakers waxed to cuspid clasps with steel pins parallel to each other and at right angles to median line.

sarily must be connected by means of a palatal bar, and cannot move individually as in the lower.

A pin of 28-gage steel wire (Fig. 22, E) is now inserted buccolingually through a tiny opening between the flat plate (A), the outer sheath (D) and the loop (B) of the stressbreaker, in order to take up the vertical play and lock the bar and sheath in position for assemblage. This steel pin presses tightly against and is therefore parallel with the flat plate

of the stressbreaker. The two attachments, with both steel pins protruding horizontally from them, are now waxed to the distolingual corners of the two cuspid clasps, in such a way that the steel pins are parallel with each other and run at right angles to the median line. (Fig. 25.) In this position, the two stressbreakers are soldered to the clasps and the surplus of the flat plates is ground off. The attachments are then drafted (tapered slightly toward the distal aspect) with hard sealing wax and lubricated, to prevent the wax pattern for the saddles from getting caught later in the undercuts.

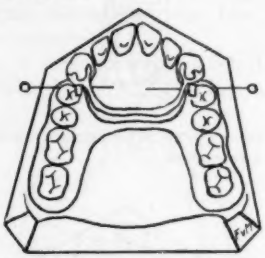

Fig. 26.—Both extension saddles and second palatal bar waxed up.

Fig. 27.—Stabilizers running from lingual arm of cuspid clasps to distal aspect of molar pontics, where they rest on saddles.

Just as in the lower case, the two extension saddles are now waxed up in their entirety, but they are connected by a second palatal bar, which runs parallel to and one-eighth inch distally from the first bar. (Fig. 26.) Since there are two palatal bars, both can be made lighter than usual. The first bicuspid pontics are ground in, so as to fit over and cover the small stressbreakers as nearly as possible. When completed, the entire wax pattern is removed from the master model, together with the first palatal bar and clasps assemblage and then drawn off distally. The pattern is cast and polished and carefully fitted over both stressbreakers. There must be sufficient clearance between the casting and the attachments to permit the proper hinge movement of the saddles. The casting is then soldered to the outer sheaths of the stressbreakers, which are antifluxed all over, except on the spots where the solder is to flow.

The two steel pins are now removed. This allows the stressbreakers to function freely and permits the extension saddles to move ridgewise. In order to overcome the natural tendency of the saddles to sag, two stabilizers are inserted (Fig. 27), each consisting of an 18-gage stiff clasp metal wire, which is attached near the lingual arm of a cuspid clasp. From there, it runs directly over the saddle, in close contact with the lingual surfaces

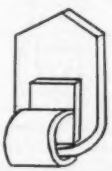

Fig. 28.—Old No. 1 Dresch attachment.

of the posterior pontics, to the distal surface of the first molar, where it terminates, but is not attached to, merely resting in a slot in, the saddle. These two stabilizers will keep the extension saddles in place, while the stressbreakers provide an upward hinge motion during mastication, limited only by the resilience of the mucosa. This removes all distal strain from the abutments, which receive only normal stress during function and are not subject to leverage from the saddle assemblage.

In case of necessity, the old No. 1 Dresch attachment (Fig. 28) can serve as a substitute for the upper stressbreaker. It operates in similar fashion and can be attached to the clasps in the manner described above. However, it would be a distinct improvement if the

vertical movement of 0.040 inch of this attachment were reduced to a minimum to avoid trauma to the alveolar ridge.

UNILATERAL UPPER CASE

For the third and final case, let us assume that in addition to the six upper anterior teeth, one molar is present, so that only one extension saddle is needed (Kennedy, Class 2). (Fig. 29.) The procedure is then somewhat different. On the side where the molar is present, a rigid assemblage is waxed up, consisting of a cuspid and a molar clasp, together with the intervening pontics. In addition, a palatal bar connecting this saddle with the cuspid clasp on the opposite side is waxed. (Fig. 30.) After the entire wax pattern is cast and finished, it is fitted to the master model and the upper stressbreaker is soldered to the distolingual corner of the cuspid clasp on the side of the extension saddle, in the manner described in the second case. (Fig. 31.)

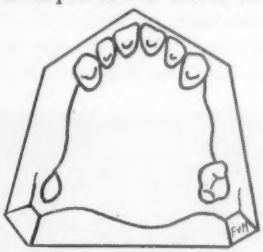

Fig. 29.—Upper case, with six anterior teeth and one molar present.

Fig. 30.—Rigid casting consisting of complete saddle on side where molar is present, cuspid clasp on opposite side and connecting palatal bar.

With a round bur, a socket about one-tenth inch deep is now drilled in the casting at the mesiolingual corner of the molar clasp, in order to form a ball and socket joint. The ball is made of clasp metal wire and turned down on a lathe till the head is 0.096 inch thick. The stem is only 0.075 inch wide and about 0.125 inch long. The ball is inserted in the socket so that the stem protrudes parallel with the steel pin, which extends through the stressbreaker on the opposite side, both being at right angles to the median line. (Fig. 31.) The attachment as well as the ball and socket joint can then rotate on the same axis. The ball is now antifluxed and placed in the socket and a thin sheet of pure gold is burnished over it. This sheet is then covered with solder and the remainder of the socket is filled with solder, so as to retain the ball permanently.

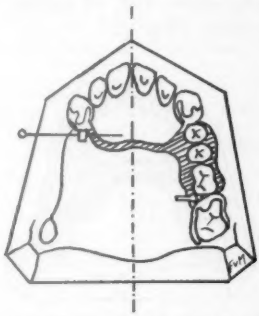

Fig. 31.—Upper stressbreaker soldered to cuspid clasp; ball and socket joint inserted near molar clasp. The stem of the ball protrudes parallel to the steel pin on the opposite side, both at right angles to the median line.

The extension saddle is now waxed up, together with a second palatal bar, which runs parallel to and one-eighth inch distally from the first bar, but terminates at the stem of the ball attachment. (Fig. 32.) The wax pattern is then drawn from the model, cast and polished. The extension saddle and second palatal bar are now soldered to the two

attachments; i.e., the saddle to the stress-breaker, and the palatal bar to the stem of the ball.

Removal of the steel pin again permits a full hinge movement on the part of the extension saddle and second palatal bar, without causing any strain on the abutments, which are connected by the stationary assemblage. The slight vertical and lateral play in the upper stress-breaker is needed to allow for the movement of the ball and socket joint on the opposite side, for without such play the case would be binding.

Just as in the second case, a stabilizer of 18-gage clasp metal wire is attached to prevent the extension saddle from sagging, and this is made in the manner described before, but, of course, on the one side only. (Fig. 32.)

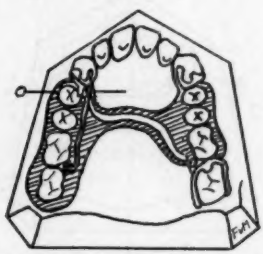

Fig. 32.—Extension saddle waxed up. The second palatal bar, parallel to the first one, terminates at the stem of the ball and socket joint. After casting and assemblage, a stabilizer is attached to the extension saddle.

The three typical cases here described will, in a general way, give an adequate picture of how to solve the principal problems of stressbreaking. Modifications of retention method or saddle design to meet special conditions may be needed, and minor deviations of the technic here presented are necessary to construct acrylic or other non-gold upper cases; but all this would carry us far beyond the confines of this essay and must be left to the ingenuity and good judgment of the individual dentist. A complete classification by Farnum of all the extension saddle case possibilities, together with suggestions for suitable designs, will be found in Nichols' textbook.[17]

CONCLUSION

From the detailed presentation of this method in its various applications, it can be seen that the objectives for ideal stressbreaking, as previously defined, have been attained so far as this is technically possible. These objectives may be recapitulated as follows:

1. The abutment teeth receive only the vertical and lateral stresses that are normal during mastication.

2. The distal leverage due to masticating pressure on the extension saddles

Fig. 33.—Upper stressbreaking case using right central and lateral incisors as abutments for extension saddle. The stabilizer runs from the right lateral incisor through the lingual groove at the cuspid, terminating at the distal aspect of the molar pontic. Notwithstanding the rotated position of the right lateral incisor and its looseness at the time that the case was constructed (three years ago), the tooth is firm and both incisors function successfully as abutments.

is completely removed from the abutments.

3. Stressbreaking is obtained through a hinge movement, parallel to the alveolar ridge, which prevents cutting or chafing.

4. There is no vertical movement at

all immediately adjacent to the abutments in the lower jaw, and there is very little in the upper, thus preventing, or at least minimizing, possible injury to the abutment teeth and their investing tissues.

5. This freedom from leverage and undue vertical movement has a favorable physiologic effect upon the abutments and surrounding soft tissues.

6. As a result of the equitable distribution of the masticatory stress over the entire alveolar ridge and the absence of vertical movement, the need for rebasing has been reduced to a minimum, and frequently has been entirely eliminated.

A method meeting all these requirements is indeed ideal and well worth studying and practicing. Stressbreaking cases made by this method require much less than the usual amount of maintenance, which relieves us of quite a problem.[18] Many of the cases have been worn as long as from fifteen to twenty years, without any adverse changes in the abutments. This is true even in extreme cases; for instance, when the upper lateral incisor has to be used as an abutment for an extension saddle. (Fig. 33.) It is needless to point out that no other method of tooth restoration, known to me at least, could have been employed in such cases, without soon having a fatal effect upon the upper lateral incisors. It has also been observed that in extensive unilateral cases, only stressbreaking has provided the means for long-time satisfactory results.

While this technic may appear involved at first and may seem to require much time and attention, a careful application to the details given here will soon show their logical sequence and is bound to produce partial dentures that will function for many years and beyond all expectations. Without wishing to detract in the least from the virtues of other stressbreaking attachments available to us, and with full cognizance of the fact that no technic is either universally applicable or always infallible, I present this method to all serious students of partial denture work, because of its undeniable merits and many advantages as well as to record it for posterity, so that it may be applied wherever there are patients who may benefit from it.

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PREVENTION OF DENTAL CARIES IN LATE CHILDHOOD AND ADOLESCENCE

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THE prevalence and extent of caries among young adults ranks tooth decay as a major problem of public health.[1] Moreover, there is no evidence that caries has lessened in its incidence during the past several decades, despite the development of measures designed to promote mouth cleanliness and the employment of prophylactic dental technics.[2, 3] Caries in the young adult is a reflection of caries experience during childhood.[4] There is urgent need for measures that will lessen the inroads of caries in children's teeth. The inefficacy of methods currently employed is reflected in the recommendation made by a prominent dental educator that until more effective measures for caries control have been established, the term "protective dentistry" rather than "preventive dentistry" be used.[5]

It would be unfortunate if the inevitability of caries were to be accepted solely on the basis of the prevalence of caries progression up to the present moment. For seventeen years, observations of children studied at the State University of Iowa have indicated that caries is preventable and controllable, and that if a suitable dietary regimen is followed consistently, the incidence of caries is reduced to a negligible level. Earlier reports from this institution dealt with clinical observations relating to arrest of caries in these children.[6, 7] They were presented in substantiation of the authors' premise that tooth decay will not develop or progress in the child who receives and utilizes a diet which is fully adequate in all respects for the needs of the body. Although this concept has been verified and corroborated by observers elsewhere,[8, 9, 10, 11] the controllability of caries through dietary means has not received general recognition. Many dentists have been unwilling to accept the concept that tooth decay may have its origin in conditions related to the general health of the subject rather than to intra-oral mechanisms.

To establish the validity of the Iowa observations, a statistical analysis of the dental records on this subject has been made. On the basis of such analysis, evidence is now available to prove beyond controversy that the incidence of caries was reduced for years to a negligible level in a large group of children and that the effect could not properly be ascribed to chance, and to offer some indication as to the possible factors in the control of caries. The statistical study has gone farther than the mere comparison of cross-sectional averages of the extent of caries: it has dealt with the observed detailed dental course of each subject over a period of several years. More than 200 children were observed jointly by the late Charles L. Drain, D.D.S., and the author.

Of that group, more than 100 children were seen recurrently for periods exceeding three years. Fifty-five of these children were observed for forty months or more following the shedding of all deciduous teeth. A study of the dental

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course of these fifty-five children offers a reliable statistical index of the nature of caries control in the whole group. All children who met the age requisites as stated above were included in the analysis, regardless of the nature of their dental course. The observation periods were sufficiently long to avoid errors due to the latency of caries. Moreover, by eliminating from consideration the period of deciduous dentition, confusion inherent in the eruption or shedding of teeth during the course of the observation was avoided. Also by starting the study in the early teens, distinctions due to the varied posteruptional age of teeth were minimized, whereas the commonness of age of the subjects served a similar function. The data relating to the progressive dental condition of these fifty-five children serve as the basis for this presentation.

PRESENTATION OF DATA

The group comprised twenty-six boys and twenty-nine girls, all of the subjects who had completed the shedding of all carious deciduous teeth and who were observed for not less than forty months thereafter. The average age at the beginning of this study was 12½ years. The duration of observation ranged from a minimum of forty-one months to a maximum of nine years. The average duration of observation exceeded five years for each child. Forty per cent of the group also had been under observation at this institution for significantly long periods prior to this study. Data relating to that interval will be reported elsewhere.

During the course of observation, each child received several painstaking dental examinations. On the average, fourteen detailed records for each subject were available for analysis. Examinations were made and recorded by Dr. Drain or under his supervision and tutelage. Throughout the course of study any cavities present were purposefully left unfilled and untreated until the course indicated that caries was not progressing, and unless the tooth damage interfered with mastication.

The subjects reviewed in this study were children who were under the medical supervision of the Department of Pediatrics because of diabetes mellitus. Only because of the disease was it possible to maintain the children under a strictly prescribed regimen of diet. Most of them came from the homes of medically indigent parents. Social services were available in the majority of instances to assure means for the maintenance of the prescribed pattern of life and of therapy. Treatment consisted in the preliminary establishment of aglycosuria and metabolic stability under hospital observation, then the establishment and maintenance of a state of diabetic control in the home. Each child's diet was designed to meet his full nutritional requirements in as nearly an ideal manner as knowledge and circumstance would permit. The actual ingredients of each day's menu were prescribed as to both nature and amount. The quality of the prescribed diet was significantly superior to that of the average normal child.[12]

The degree of cooperation in medical care and in observance of the prescribed diet varied individually, and from time to time in the same subject. For three subjects included in the study, socioeconomic conditions imposed insurmountable obstacles to the establishment or maintenance of the prescribed dietary regimen. Numerous other instances were recognized in which laxness or intermittent abandonment of the prescribed routine was indicated or admitted. In most of the children, however, and for the major portion of the periods of their observation, the degree of dietary and of medical control was superior to that commonly obtained either with diabetic or with normal children. Almost without exception, the level of health was

TABLE 1.—SERIAL DENTAL STUDIES OF PERMANENT TEETH OF TWENTY-NINE TEEN-AGE DIABETIC GIRLS*

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
									Incidence of DMF Tooth Surfaces†					
									Initial Status		Terminal Status			
Subject Number	Age at Onset of Diabetes‡	Age When Prescribed Regimen Was Begun‡	Age at Beginning of This Study‡	Age at Terminal Observation	Total Duration of Observation‡	Age Intervals During Which No Extension of Caries Could be Demonstrated‡	Duration of Complete Arrest of Caries‡	Initial Number of Deciduous DFTS‖	DMF Surfaces	No. of Permanent Teeth in Mouth	DMF Surfaces	No. of Permanent Teeth in Mouth	Total New DMFTS†	New DMFTS per Annum†
x4	59	92	142	224	82	142–224	82	3	0	28	0	28	0	0.00
x37	107	111	119	203	84	119–203	84	2	0	26	0	28	0	0.00
x58	68	94	111	185	74	111–185	74	2	0	22	0	28	0	0.00
x91	71	78	131	225	94	131–225	94	2	2	28	2	28	0	0.00
x19	80	111	149	242	93	149–242	93	2	3	28	3	28	0	0.00
x42	96	99	127	201	74	127–201	74	16	4	20	4	28	0	0.00
x23	164	165	165	210	45	165–210	45		5	26	5	28	0	0.00
x45	84	95	120	191	71	120–191	71	34	5	25	5	28	0	0.00
x78	162	170	170	244	74	170–244	74		7	26	7	28	0	0.00
x77	140	155	164	210	46	164–210	46		8	28	8	28	0	0.00
x89	137	140	140	180	40	140–180	40		15	26	15	26	0	0.00
x71	42	151	151	250	99	151–177+	50 +		0	27	1	28	1	0.12
x96	96	98	113	171	58	113–168	55	9	0	24	1	28	1	0.22
x97	95	109	129	198	69	129–145	16	2	2	26				
						152–187	35				4	28	2	0.35
x60	114	116	134	195	61	134–193	59	9	5	23	7	26	2	0.39
x48	136	137	137	192	55	137–149	12		5	26				
						151–179	28				7	28	2	0.44
x12	138	150	150	201	51	150–169	19		3	27				
						172–192	20				5	27	2	0.47
x22	127	140	170	214	44	170–214	39		13	28	15	28	2	0.54
x11	140	142	155	197	42	165–197	32		8	27	10	27	2	0.57
x79	117	140	140	198	58	140–179	39		4	22	7	28	3	0.62
x72	143	147	147	201	54	147–183	36		3	28	7	28	4	0.89
x84	142	154	154	205	51	166–204	38		5	24	9	28	4	0.94
x55	160	164	164	214	50	167–190	23		11	28				
						203–214	11				15	28	4	0.96
x57	162	171	171	217	46	171–191	20		15	27	19	27	4	1.04
x29	139	143	143	217	74	143–167	24		7	28				
						169–191	22				14	28	7	1.12
x13	99	110	122	182	60	130–143	13	2	2	22				
						155–178	23				10	26	8	1.60
x33	137	149	149	225	76	‖			11	28	29	25	18	2.84
x95	125	126	126	171	45				6	24	18	26	12	3.20
x94	88	89	113	193	80			20	22	18	76	25	54	8.10

*Observed for average period of sixty-four months while presumably following a prescribed dietary regimen.

†DMF tooth surfaces (DMFTS refers to decayed, missing or filled tooth surfaces) include tooth surfaces damaged by caries. Teeth missing because of decay are considered to have had three carious surfaces. Non-carious extracted teeth are not included in the score of carious teeth.

‡All time notations refer to months.

‖Value for extent of deciduous caries relates to time of earliest dental record.

high, and severe diabetic complications were decidedly uncommon.

The data relating to the problem under consideration are summarized in Tables 1 and 2. In review of the data the following points deserve special comment: Almost without exception, these children were free from advancing caries for long intervals of time. When caries progressed, the new lesions tended to be few and of no great extent. The annual increment of caries was zero or negligible in the great majority of subjects. Those who showed noteworthy progression of caries had currently or persistently failed to follow the prescribed regimen of diet.

In twenty children, no advance of caries was demonstrable throughout the whole period of observation, an average of sixty-eight months for each child. Fifteen showed no advance for five years or longer; twenty-six for four years or longer; forty-three for three years or longer, and forty-nine for two years or longer. Only three children, all girls (subjects Nos. x33, x95 and x94, Table 2, column 1) failed to show any significant interval of non-advance of caries. Two of these were sisters. In the two homes represented by these non-conforming cases, conditions were such that manifestly the regimen of diet and of diabetic control could not be maintained in any significant degree. The medical state of these children paralleled the severity of the dental disease. Extent of caries has been expressed in terms of the number of decayed, missing or filled tooth surfaces (hereinafter referred to as DMFTS) in each mouth. The actual extent of decay frequently was less than the stated values would indicate. Many lesions were pits and fissures which were not significantly involved and which did not enlarge subsequently. The rate of progression has been expressed in terms of the number of new DMFTS for any individual subject, divided by the duration of observation. This is listed in Tables 1 and 2, columns 15, as new DMFTS per annum. The median rate of advance for the whole group was 0.37 DMF tooth surfaces per annum. The average value, even though heavily weighted by the high rates of advance in the non-conforming subjects, was only 0.49 for the boys and 0.86 for the girls, or 0.695 for the whole group.

The duration of freedom from caries for each subject is recorded in column 8. When advance of caries occurred, it usually was interspersed with long periods of non-advance. In many instances, these periods of advance could be correlated directly with known lapses in the prescribed dietary regimen. The duration of periods of advance could not be determined exactly. It was based on the lapse which occurred between periods that were demonstrably free from advance. If the rate of advance of caries (new DMFTS per annum) is calculated on the basis of the duration of the presumed period of advance rather than on the total period of observation, the average increment rate was five times as great as the average rate for the whole period of observation and approximates that observed in the general child population of corresponding age.

DISCUSSION

Published dental statistics relating to the incremental rate of caries are based, for the most part, on interpolations rather than on observed rates of advance. The interpolations have been drawn from cross-sectional averages of observations of large child populations. An excellent study of this type has been reported by Klein and Palmer,[13, 14] who, on the basis of such interpolations, predicted that the children in the area studied (Hagerstown, Md.) might be expected to develop decay in two new tooth surfaces each year during the early teens. The average extent of tooth decay in the 13-year-old children was 7.9 DMFTS; at 14 years, the value was

TABLE 2.—SERIAL DENTAL STUDIES OF PERMANENT TEETH OF TWENTY-SIX TEEN-AGE DIABETIC BOYS*

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
									Incidence of DMF Tooth Surfaces*					
									Initial Status		Terminal Status			
Subject Number	Age at Onset of Diabetes‡	Age When Prescribed Regimen Was Begun‡	Age at Beginning of This Study‡	Age at Terminal Observation	Total Duration of Observations‡	Age Intervals During Which No Extension of Caries Could Be Demonstrated‡	Duration of Complete Arrest of Caries‡	Initial Number of Deciduous DFTS⧗	DMF Surfaces	No. of Permanent Teeth in Mouth	DMF Surfaces	No. of Permanent Teeth in Mouth	Total New DMFTS†	New DMFTS per Annum†
y36	42	138	138	193	55	138–193	55		0	20	0	26¶	0	0.00
y37	89	90	140	202	62	140–202	62	17	0	24	0	28	0	0.00
y44	80	84	130	207	77	130–207	77	13	0	22	0	28	0	0.00
y60	124	127	156	245	89	156–245	89		0	28	0	28	0	0.00
y101	122	158	158	199	41	158–199	41		0	24	0	28	0	0.00
y103	115	116	116	210	94	116–210	94	0	0	28	0	29	0	0.00
y86	127	134	134	226	92	134–226	92		1	28	1	28	0	0.00
y45	81	101	169	224	55	169–224	55	6	3	28	3	28	0	0.00
y82	143	167	167	213	46	167–213	46		4	28	4	28	0	0.00
y6	122	152	176	233	59	176–197	21		7	27				
						212–235	23				8	27	1	0.20
y92	152	164	176	231	55	176–189	13		7	27				
						192–231	39				8	28	1	0.22
y11	114	117	117	189	72	117–131	14		10	15				
						133–189	56				12	28	2	0.33
y109	46	81	168	235	67	168–209	41	21	0	28				
						214–235	21				2	28	2	0.36
y18	120	134	144	202	58	144–155	11	5	2	21				
						158–202	44				4	28	2	0.41
y84	156	173	173	224	51	176–212	36		2	28	4	30	2	0.47
y74	152	155	160	198	43	160–192	32		14	28	16	30	2	0.56
y13	125	145	145	197	52	145–161	16		10	28	13	28	3	0.69
y79	149	150	150	212	62	150–195	45		10	27	14	27	4	0.77
y58	122	123	141	215	74	141–167	26	9	3	24				
						171–191	20							
						201–214	13				8	28	5	0.81
y20	173	174	174	214	40	174–188	14		0	28	3	28	3	0.90
y1	142	158	158	210	52	163–201	38		15	26	19	29	4	0.92
y14	73	145	145	194	49	145–183	38		0	28	5	23§	5	1.22
y43	152	153	153	210	57	153–179	26		10	25	16	26	6	1.26
y81	161	173	173	214	41	173–184	11		11	28	16	28	5	1.46
y111	170	171	171	234	63	174–203	29		5	26				
						212–228	16				14	25	9	1.72
y88	170	172	172	216	44	175–207	32		4	27	11	27	7	1.92

*Observed for average period of sixty-two months while presumably following a prescribed dietary regimen.

†DMF tooth surfaces (DMF refers to decayed, missing or filled) include tooth surfaces damaged because of caries. Teeth missing because of decay are considered to have had three carious surfaces. Non-carious extracted teeth are not included in the score of carious teeth.

‡All time notations refer to months.

⧗Value for extent of deciduous caries relates to time of earliest dental record.

¶This child had congenital absence of two teeth.

§This child lost five non-carious teeth while under observation by his local dentist because of pyorrhea.

11.4, and by the age of 19, it had risen to 24.7. The average incidence of decay in these children did not differ notably from that recorded by Brauer[15] in children examined in the dental clinic of the State University of Iowa (Fig. 2.)

The clientele included in Brauer's study was largely composed of children who came routinely to the clinic to have dental surveys made for school records. His group as a whole probably was typical of what one would find in the average school population. For that reason, it seems justifiable to use Klein and Palmer's Hagerstown data as a basis for rough comparison with the data from the current study. When such a comparison is made, the low rate of advance in the diabetic children is outstanding. When the three known dietary non-conformists are omitted from consideration, the average annual increment rate for the diabetic children was less than 0.42, as compared with Klein and Palmer's prediction of 2.0. Particularly significant are the long periods unmarked by an advance of caries in any degree.

This phenomenon of complete arrest seems to be the outstanding characteristic of caries control in these children. When caries did progess, the rate of progression was higher than Klein and Palmer's predicted norm, but less than values observed in control groups by Howe [8, 9] or by McBeath.[11] Periods of advance may be justifiably interpreted as the corollary of relaxation or abandonment of the prescribed dietary regimen. Throughout the twelve years during which the currently reported observations were made, the impression was gained that as long as the children ingested and utilized the diets as prescribed, caries did not advance.

Before accepting the premise that the reduction of caries in these children was due to the nature of their dietary regimen, it is necessary to determine whether other recognizable agencies might explain the incidence of caries control. The following hypotheses have been suggested: 1. Does the group represent children who naturally were non-susceptible to caries? 2. Was the low caries increment rate dependent on the degree and extent of caries present at the initial observation? 3. Did the level of fluorine in domestic water supplies of the individual child play any demonstrable rôle in his resistance to caries? These three

TABLE 3.—COEFFICIENTS OF CORRELATION BETWEEN ANNUAL INCREMENT OF CARIES, INITIAL EXTENT OF TOOTH DECAY, AGE AT ADOPTION OF DIET CONTROL AND FLUORINE CONTENT OF DOMESTIC WATER SUPPLY

	Coefficient of Correlation (r)	
	Group 2 N=52	Group 2 N=21
Annual caries increment (from column 15, Tables 1 and 2) vs.		
Postshedding incidence of caries (from column 10, Tables 1 and 2)	0.31*	0.16
Age at onset of dietary control (from column 2, Tables 1 and 2)	0.47†	0.60†
Minimum regional fluorine content	−0.04	−0.03
Maximum regional fluorine content	−0.07	−0.05
Postshedding incidence of caries (from column 10, Tables 1 and 2) vs.		
Age of onset of dietary control	0.56†	0.26
Minimum regional fluorine content	−0.20	−0.01
Maximum regional fluorine content	−0.15	−0.24
Significant values for r:		
95 per cent level	0.273	0.433
99 per cent level	0.345	0.549

Group 1 (N=52) comprises all subjects who ostensibly were observing the prescribed dietary.

Group 2 (N=21) comprises the twenty-one subjects who had adopted the prescribed dietary regimen less than twelve months prior to the beginning of this study.

*Statistically significant values.

†Highly significant values (99 per cent level of confidence or greater).

questions will be considered serially.

Three facts tend to confirm the belief that these fifty-five children initially possessed the same susceptibility to caries as may be observed in the average child population, and that, unless their regimen of dietary control was maintained, caries progressed in their teeth as in any group of average children.

(a) Figure 1 shows the incidence of decay in the deciduous teeth of twenty-two of these children who were observed for significant periods of time before all carious deciduous teeth had been shed. Distinction is made between those who had been under dietary management elsewhere for a year or more before the earliest dental examination was made in

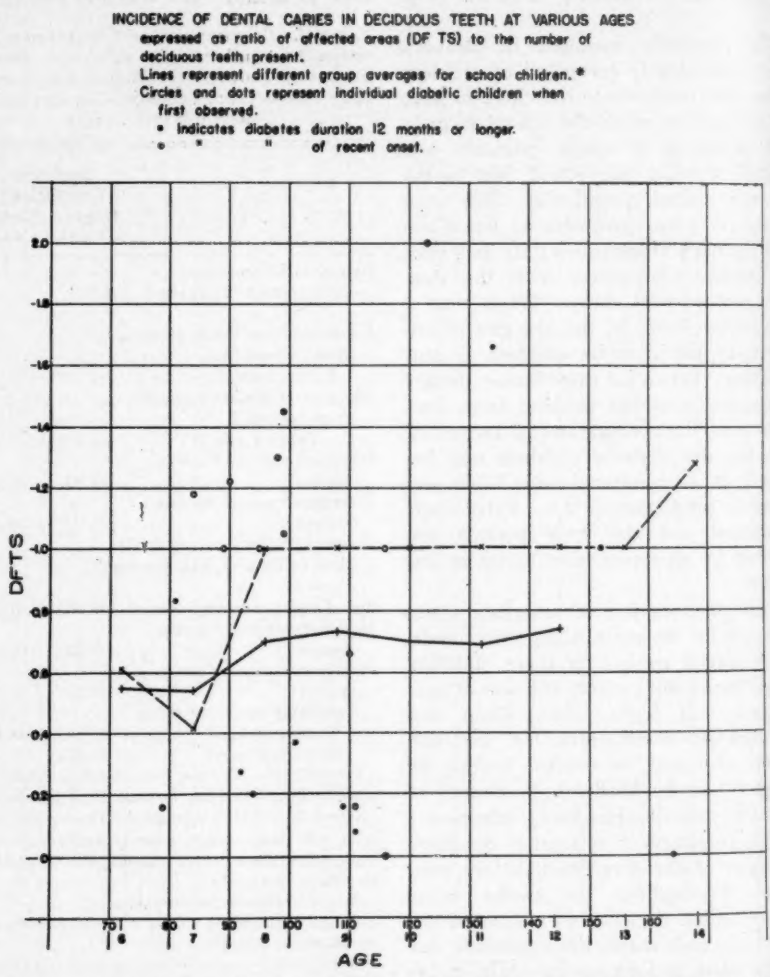

Fig. 1.—Data from Hagerstown study (broken line) and from Dental Infirmary, State University of Iowa (solid line).

our dental clinic, and those who had just developed diabetes when first seen here. The latter group tended to show as much as, or more than, the average values for caries shown for normal children in comparison. Most of those who had been under some form of dietetic regulation for a year or more, in contrast, had decidedly less than the average caries in the deciduous teeth.

(b) Figure 2 shows the extent of caries in permanent teeth following the completion of shedding of all carious deciduous teeth. The values were taken from column 10, Tables 1 and 2. Here again, distinction has been made relating to the previous experience with dietary control, identifying those who had not been under dietary supervision previously, those who had been treated elsewhere for a year or longer and those who had been under the care of this clinic for a year or more prior to the dental record indicated. The diagram shows that, initially, most children tended to have caries similar in degree to that observed in average children, but that the maintenance of the prescribed regimen was accompanied by lower values for caries extent.

Further study of the data reveals that, without exception, those children whose dietary control was established prior to the age of 6 years were entirely free from caries of the permanent teeth when shedding had been completed. Furthermore, the incidence of decay following shedding was only 27 per cent as great in the seventeen children who started the dietary regimen prior to the age of 9 years as it was in the remaining thirty-five ostensibly conforming to the dietary and whose control dated from a more advanced period of childhood. The average incidence of DMFTS at the age of 159 months for those who assumed diet control prior to the age of 9 years was 1.76. For those who assumed diet control subsequently to that age, the average incidence was 6.36 DMFTS. The statistical validity of this outstanding difference between the means is established by the t test, designed for small samples. The value for t was such that it indicated significance at the 99.9 per cent level of confidence. In view of the homogeneity of the subjects studied in respects other than the duration of the dietary regimen, it seems justifiable to conclude that the extent of caries during the teens in these children was determined by the duration of dietary control prior to the age in question.

(c) The diabetic state in itself offered no safeguard against the progression of caries, nor did the mere prescription of a dietary regimen. The three subjects who failed to follow the prescribed regimen for any significant interval showed steady and noteworthy increase in the incidence and extent of caries. The progression of caries in other subjects during intervals of nonconformance has been discussed previously.

From the foregoing evidence, one must conclude that the children who served as subjects for this study were not innately resistant to tooth decay. To determine whether either the initial extent of caries or the degree of flourine ingestion was a significant factor in caries prevention, statistical correlations have been made between the relevant factors. It was desired to compare the caries pattern only in those who ostensibly had followed the prescribed regimen of diet. For that reason, the three above-mentioned non-conformists were not included in these analyses.

To permit appraisal of the effect of diet in terms of duration of its employment, separate consideration has been given to a subgroup of twenty-one of the subjects who had submitted to diet control within a year or less from the time of the initiation of the current study. For the whole group of fifty-two children and the subgroup of twenty-one, correlation coefficients were deter-

mined between the values in columns 2, 10 and 15 of Tables 1 and 2, and also the minimum and maximum reported values for fluorine content of the water supplies for the area of residence for each child. (Data regarding the fluorine content of water supplies was obtained from a published survey[16] based on approximately 2,000 water analyses made during a period of eighteen months, together with additional subsequent unpublished data. Included were representative samples from all parts of the state, from municipal, rural, industrial and other wells. In many instances, it was not possible to determine the exact source or sources of the domestic water supply for the individual child. For that reason, both minimum and maximum reported values for the zone of residence of each child were used separately in the correlations.) A summary of the statistical analysis is offered in Table 3.

The values in Table 3 demonstrate the high level of correlation between the age when dietary control was instituted and the extent of caries at the time of completion of the shedding of deciduous teeth. Similarly high correlation is noted between the age when the dietary regimen was begun and the annual increment of caries during the teens. The correlation between the extent of caries at the end of the shedding period and the subsequent annual increment of

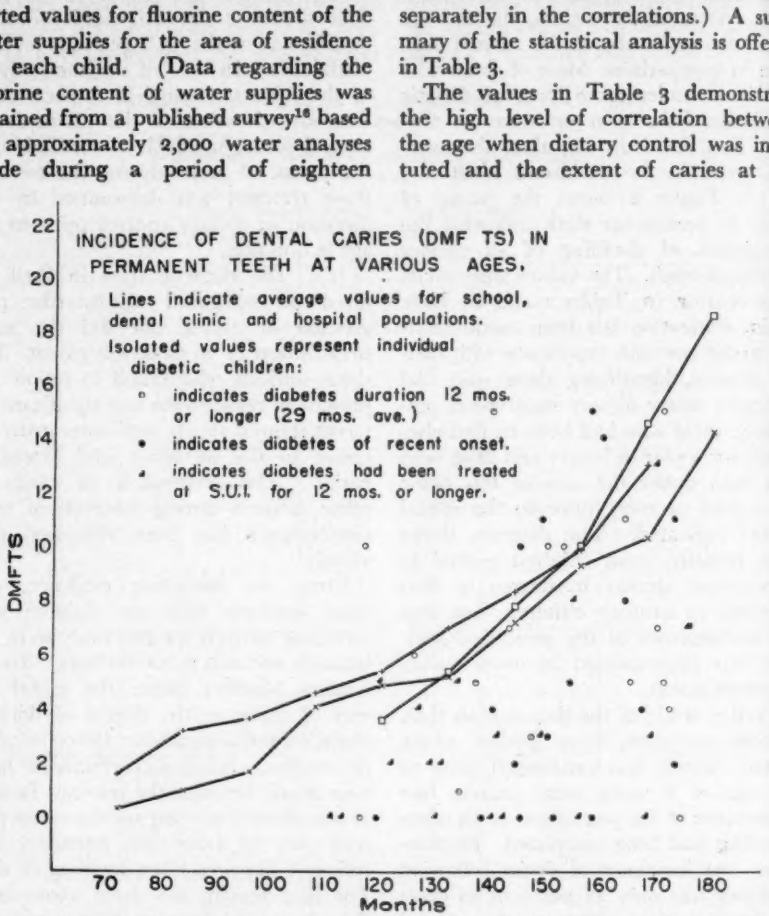

Fig. 2.—Data from Hagerstown study (line broken by x's); from Dental Infirmary State University of Iowa (line broken by plus signs), and from orthopedic patients with non-infectious crippling conditions, Children's Hospital (line broken by squares).

caries is significant, but of a lower order than those correlations concerned with the age at the commencement of diet control. Evidently, the significance of the extent of caries as it may affect the subsequent course is indirect. It is determined in itself and in its effect by the preceding regimen of diet. This may be demonstrated statistically. Determination of the coefficient of partial correlation between the relative effect of the postshedding extent of caries and the other two variables gives a value of 0.08, which is without statistical significance. On the basis of these analyses, one may conclude that the most effective agent in checking caries in these children was the dietary regimen employed and the length of time that it had been in force.

There was no evidence of significant correlation between the level of fluorine supply and the extent or the increment rate of caries. The coefficients of correlation are negative, suggesting a reciprocal relationship between the two factors, but the coefficients are so low that the observed relationships may be attributed to chance alone. The possible rôle of fluorine ingestion on the course of caries is not invalidated by these observations. The evidence does indicate, however, that if fluorine has played any part in the caries pattern of these children, its effectiveness has been outdistanced may times over by that of diet. The incidence of tooth decay in the children who had been under diet control for appreciable periods of time was only a fraction of that observed by Dean in children from suburban Chicago who had ingested fluorine in presumably ample amounts since the time of earliest childhood.[17]

The critical reader may question whether it is possible in practice to maintain a strict regimen of diet such as was prescribed for the children who served as subjects for this study. Such a question is justifiable. Nevertheless, there is much evidence that, with wise supervision of the diet, caries is lessened in occurrence and extent. Parallel observations indicate the favorable effect of improved diets on the health of the child. Surely, the dietary approach offers the most effective means of attack on the problem of caries now available, and furthermore is one which is in step with current policies for the furtherance of public health. With prevalent improvement of the quality of children's diets, the seriousness of dental caries as a public health problem will decline to minor proportions. With the assurance of ideal nutrition for the individual throughout childhood, there is reason to hope that caries will be abolished.

SUMMARY AND CONCLUSIONS

The main purpose of this presentation has been to demonstrate that caries can be prevented and arrested through dietary measures alone, and to make available the detailed data from which such a conclusion was drawn. Questions relating to the manner in which the diet has exerted a favorable effect on caries have not been discussed. Evidence that caries prevention and arrest are to be attributed to a high biologic worth of the diet, and that the sugar content of the diet appears to be of secondary importance, will be presented later.

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DIAGNOSIS AND TREATMENT OF ORAL NEURALGIC PAINS

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THE dentist today is often called upon to deal with pains which originate in the jaws, and which cannot always be attributed to the teeth. In some cases, these pains are present in the edentulous mouth; in others, they originate at the site of recent extractions. Often, the trouble begins around a particular tooth, the extraction of which does not alleviate the condition. Again, it may center around certain teeth that show no pathosis.

In the cases under consideration, examination of the jaws clinically and by means of roentgenograms reveals no unerupted or retained teeth or roots or other conditions that could cause these disturbances. Likewise I am not referring to the numerous cases in which dental pain is caused by impacted teeth, pulp stones, putrescent pulps, salivary calculi in ducts or cysts of the jaw. The literature is replete with reports of relief obtained from the elimination of these causes.

In all types of cases to be discussed, the patient suffers from many degrees of pain. Sometimes, the trouble is mild, but annoying. More often, the pain is more severe and disturbing. In other cases, it is so intense that it upsets the patient's routine of living. The last condition should not be confused with that form of pain known as trigeminal neuralgia or other major neuralgias.

Most of the conditions are to be described as neuralgia and, in the main, such a classification may be true. However,

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it has been stated on good authority[1] that all true neuralgia is central in origin and that all other types of pain found in and around the oral cavity are forms of neuritis. Mechanical injury is one cause of neuritis, and this condition is often found in the mouth. It is a controversial point, as the symptoms in many of the cases I examine seem to agree with the definitions of both neuralgia and neuritis.

Webster defines neuralgia as an acute pain, constant or intermittent, radiating along the course of a nerve and its branches; also the morbid condition characterized by such pain. Neuritis is defined as an inflammation of a nerve characterized by pain, sensory disturbances and reflex abnormality or other signs of nervous disability in the part affected.

It can readily be seen that the only way to prove the category into which a condition fits is to resect the tissues. If an inflamed nerve is found, neuritis is present; if not, neuralgia.

ANALYSIS OF CASES

A survey of 180 recorded cases of persistent pain gave, roughly, the accompanying classification. The reason for keeping a record is that most of the cases respond to similar forms of treatment. Some cases may overlap from one type of pain to another at various times. Then again, simple pains may develop into more severe and persistent types if left untreated. Also, I observe some forms of pain the diagnosis of which can be placed under several headings.

SURVEY OF ONE HUNDRED EIGHTY CASES OF PERSISTENT PAIN

Type of Pain	Number of Cases
Referred pain	13
Thermal pain	12
Mild and severe neuralgia	62
Postoperative neuralgia	66
Atypical neuralgia types	20
Bursitis of temporomandibular joint	4
Antrum pains	3

A check of the tabulated cases will show that the most numerous types are the various forms of neuralgia. Referred pain and thermal pain are often called neuralgia or neuritis before a diagnosis is made. They are often found in combination. However, after a careful examination, their true status is easily revealed. It is in these divisions of cases that we have teeth as the exciting cause.

REFERRED PAIN

There were thirteen cases of referred pain. In each one, the pain was referred from a tooth or part of the jaw to another tooth or some distant part of the jaw or face.

Very little has been written regarding the etiology of referred pain in or about the jaw. It is probably caused by irritation of the nerves of the teeth or the jaws referred to the gasserian ganglion. This stimulates other parts of the ganglion and the pain is referred to other branches of nerves emanating from it.

THERMAL PAIN

There were twelve cases of thermal pain. In these cases, one or more teeth react to varying degrees of either hot or cold, or both. Examination shows no valid reason for such reactions. The trouble starts spontaneously and it is not the pain originating under new fillings. Occlusal trauma is not present, but there may be old deep fillings or pulp stones. There is no soreness on percussion. Contact with cold drinks, ice cream or cold air may start the pain. In other cases, contact with cold or heat, or both, starts the trouble. In fewer cases, only heat is the irritant. I exclude the type of cases associated with a degenerating pulp. In all these cases, there is a positive response to the vitality tester, especially in teeth reacting to cold. In those responding to heat only, there is a lesser response to the tester.

To determine the cause of this condition is difficult. It may be some form of

arterial hyperemia and, occasionally, some types may be related to a venous form of hyperemia. It is also possible that there is a disturbance of the autonomic sympathetic nervous system.

According to Cahn,[2] the preganglionic seventh, ninth and tenth cranial nerves travel from the spinal cord and neck to the salivary glands and make their way into the tooth pulps. He says,

> There are also some that probably follow the same course but have their origin in the upper thoracic segments of the spinal cord. These come out from the ganglia arranged along the side of the cord, undoubtedly the stellate ganglia.

They control contraction and dilation of the pulp and may be responsible for some of the conditions known as atypical neuralgia.

I treat these cases successfully by the application of quartz light therapy without opening the pulp chamber. Cahn believes that the actinic rays may cause a vasodilation that is beneficial.

NEURALGIA

I have recorded sixty-two cases of mild and severe neuralgia. Although they both come under the general definition of neuralgia, I classify them according to differences in the degree of pain and as to whether these symptoms are simple or complex. A long-standing neuralgia could be called severe even though the pain were not so great. The reason for this is that a long-continuing pain, although not extreme, tends to undermine the resistance. Pain can further be distinguished by referring to it as a mandibular or a maxillary neuralgia.

The etiology is obscure, but may be somewhat similar to that described in referred pain. It is possible that many of the long-standing cases that we describe as neuralgia could be classified as neuritis. Sometimes, the symptoms fit the definition of neuritis, but they have been classified as one type to prevent confusion.

The pain may be dull or very sharp, constant or intermittent. It may be confined to the jaws only or may include the face. Periodontoclasia may be present.

Mandibular and maxillary neuralgia is not related to the painful symptoms associated with ear conditions caused by reduction of the vertical overbite. These symptoms are supposed to be caused by the erosion of the bone of the glenoid fossa. The rocking movements of the temporomandibular joint cause pressure on the auriculotemporal nerve and the chorda tympani nerve. Block and Harris[3] have recently published a comprehensive paper on temporomandibular joint problems. They show that diagnosis of the symptoms of this condition requires much study and thought. Also, a fundamental knowledge of anatomy, physiology and pathology is necessary, aided by roentgenographic and clinical examination. They show that the three vital factors to be considered in every mouth condition are: (1) centric relation, (2) vertical dimension and (3) balanced occlusion. Rebuilding of the jaws according to these specifications is the solution, and these authors claim a high percentage of success in so treating these types of cases.

Maxillary and mandibular neuralgia are very often confused with sphenopalatine ganglion neuralgia. This pain is often seen first by the dentist, and it is important to diagnose it because, in the hands of an otolargyngologist, it can be quickly relieved.

According to Watt W. Eagle,[4] it is a unilateral facial pain and not a headache. It never extends above the level of the ear. He says,

> The pain is usually lancinating and continuous; it may last from a period of a few minutes up to several days at a time, recurring after no special interval and always more or less repeating the previous episode. There are usually two main points of maximum pain, one in the region of the orbit and the root of the nose and the other in

the region just posterior to the mastoid process in the temporal bone. In some patients, only one of these points of maximum tenderness is present, that more likely being the region the orbit and the root of the nose. If both points of intense pain are present, the pain seems to originate in the root of the nose and to involve the orbit, causing extreme soreness in the eyeball, and extend back through the eye into the region of the ear, frequently causing earache and a sensation of fulness of the ear and tinnitus.

To establish the diagnosis, the sphenopalatine ganglion is cocainized through the nose and, if the pain disappears in a few minutes, the diagnosis is considered correct. Sometimes, the ganglion is injected with a small amount of alcohol.

POSTOPERATIVE NEURALGIA

I have listed sixty-six cases of postoperative neuralgia, the most common classification in my records. The pain syndrome, which is occasionally seen by dentists, involves either the mandible or the maxilla, following extraction or other surgical measures. Postoperative neuralgia differs from the usual traumatic pain in that it is not localized. It is generally unilateral and affects the jaw bones, face, neck and ears. It may be accompanied by inflammation. The pain is usually a dull and continuous type, with no remissions. In some cases, the pain is sharp in the beginning, later becoming dull. Occasionally, postoperative neuralgia takes on the characteristics of referred pain, because the pain is transmitted to other parts of the jaw, face and neck in addition to the region of the original disturbance.

The patient usually gives a history of single or multiple extractions from one to ten days earlier. In most cases, several days pass before the full force of the pain is felt. Other cases report the pain to have started after the effect of the local anesthesia wore off. In a few cases, the complete syndrome of pain was felt before the extraction. The patients complain of a dull continuous pain persisting since the extraction and get relief only from continuous use of bromides or other sedatives.

Many patients have the condition erroneously known as dry socket, sometimes in a severe form, but generally mild. The clot may be missing from the socket with no perceptible infection present. Often, there appears to be a normal clot. In some extreme conditions, the patient has been suffering from neuralgia for more than a week, during which the socket has completely healed. Thereafter, the pain will eventually disappear, but the patient is left debilitated and in a nervous condition. At other times, the pain persists long after the healing has taken place.

The most common site of this neuralgia is the socket of the lower third molar, especially if the tooth has been impacted. Next in order of frequency is the sockets of the lower first molar, lower bicuspid and upper first molar. However, the symptoms may follow extraction of any tooth in the mouth.

The diagnosis of postoperative neuralgia is assumed in these cases. It appears that the contiguous nerve supplying the tooth becomes inflamed through trauma or infection, or both. The temporary relief that sedative dressings give is probably due to seeping of the anesthetic material through the bone into the nerve fibers. From this description, one could classify the condition as postoperative.

ATYPICAL NEURALGIA TYPES

Cases of atypical neuralgia are often classified as trigeminal neuralgia. My records show twenty cases. To clarify these types of pain, I shall briefly add definitions of major neuralgia and atypical neuralgia.

Herman Chor writes,[1]

> True neuralgia is characterized by its paroxysmal nature, whereby "explosions" or "bursts" of severe, sharp lancinating pain strike the patient. Such attacks of pain last

only a few seconds, rarely longer than half a minute. This short duration is a cardinal feature of true neuralgia. If the pain lasts longer, that is, for several minutes or half hour or more, it cannot be diagnosed as neuralgia.

He also mentions that, in neuralgia, the pain follows the course of a nerve and is not disturbed over the area beyond that supplied by a particular nerve.

In trigeminal neuralgia, the main point in diagnosis is the presence of a trigger zone. Only a slight touch in these areas starts the pain. There may be remissions of pain in some cases of true neuralgia. Reported cures following extraction or other dental operations may be due to this fact. Other types of true neuralgia are glossopharyngeal and superior laryngeal neuralgia.

L. B. Bender says,[5]

Atypical neuralgia is a type of pain about the face and head which does not fall into classification of true trigeminal neuralgia. It is usually very difficult to treat. Pain persists in these cases even after the gasserian ganglion has been removed. The attacks are chronic and usually bilateral in character, dull, deep aching pain in the eye, molar region about the ear and face and worse at night.

Glaser[6] describes atypical neuralgia as of unknown etiology, with failures to respond to clinical relief.

Certain types of atypical neuralgia appear to simulate trifacial neuralgia in some of the later phases. It can be noted that there appears to be a close relationship between some forms of atypical neuralgia and various forms of neuritis.

Very little has been written regarding the etiology of atypical neuralgia. It is believed that the autonomic systems play a rôle in the etiology of some cases. However, L. J. Pollack and L. Davis[7] have the following to say:

Painful impulses may be conducted along the sympathetic nerve fibers or the visceromotor or other reflex activities may produce conditions which in turn are responsible for conscious pain. On the other hand, both mechanisms may be present.

Long-standing cases of neuralgia can be classified as the atypical type, because the definitions describing these conditions are rather variable and vague.

Bursitis and antrum pains are distinct entities and will not be discussed in this paper although both respond to the form of treatment herein described.

TREATMENT

The principal form of treatment employed in attacking all these previously described forms of pain is physiotherapy, including use of the infrared lamp, the mercury quartz lamp and short wave diathermy. The quartz lamp that I use for this work is one of the more powerful types, developing 28 per cent ultraviolet light. In some cases, I manipulate the tissues in the area about the affected parts, paying especial attention to terminal nerves of the infra-orbital and mental regions. This action is a combination of massage and stretching. These modalities are in addition to the routine treatment such as irrigation and dressing of wounds in postoperative neuralgia.

Prostigmine methylsulfate 1:2,000 and prostigmine bromide have been used successfully in treating neuritis of the face and neck region. Thiamine chloride is of value in the treatment of neuralgia.

Occlusal trauma should be relieved whenever encountered.

The exception to these forms of treatment is the handling of referred pain. In this condition, the cause must be ascertained and removed. It may lie in an inflamed pulp, an obscure abscess or an infected antrum.

Thermal pain is treated specifically by the quartz lamp as previously mentioned. I use a powerful water-cooled lamp and apply the light by means of quartz rods, using a round applicator one-half inch in diameter or a larger rod with a square

face measuring about three-fourths inch across. The gums surrounding the suspected teeth and the teeth adjacent are radiated over all the labial, buccal and lingual surfaces involved to a height of one-half to three-fourths inch. At the initial exposure, ten seconds is given to each place of application, and this is increased by two or three seconds at each successive treatment. A slight amount of pressure is employed to dehematize the tissues in using the quartz rods. This is the basic technic for most quartz light applications intra-orally. The teeth should also be exposed to the light.

In mild and severe neuralgia, the infrared lamp is employed for twenty minutes at 18 inches. This generally gives some degree of relief, but if it does not, its use is discontinued in this particular case. Either ultraviolet irradiation intra-orally and extra-oral or short wave diathermy follows, according to the experience and judgment of the operator. Often, both agents are used, especially in severe cases. When the pain is centered around the mental or infra-orbital foramen, I employ also manipulation of the facial tissues about these areas.

The quartz lamp is used with the technic previously described intra-orally and extra-orally, with the direct face of the lamp against the seat of complaint at about 4 inches for ten seconds. This extra-oral exposure is increased two or three seconds at each subsequent treatment. A brunet will tolerate more irradiation at each sitting than a blonde.

The short wave is applied by rubber pads well covered by two or three layers of turkish toweling, one on each side of the face. The heat is applied from seven to ten minutes at 2,000 to 4,000 milliamperes, the milliamperage depending on the amount of warmth tolerable to the patient.

Most cases of postoperative pain following extraction or surgical procedure will respond to the newer type of drugs now used for dressing wounds, and can be kept under control by frequent replacements. It is the exceptional case that does not respond to this orthodox treatment with which I am concerned. In these cases, the operative site is first cleaned up and a sedative dressing placed. Next, the patient is given twenty minutes' exposure under the infrared lamp at 18 inches, and, in nearly every case, relief is obtained. Next, the entire intra-oral area about this part is exposed to the quartz lamp by means of a large quartz applicator, described in the preceding paragraph. Next, the extra-oral parts are exposed to the direct rays of the lamp. The next day, the patient usually reports that he has had hours of relief, and then a recurrence. I then repeat the treatment, but increase the dosage of light. Recently, I have employed the short wave diathermy in addition to the foregoing treatment, and I find that it shortens the course considerably. Frequently, one application of the short wave will terminate the pain.

Atypical neuralgia responds to the treatment described under mild and severe neuralgia.

I have mentioned bursitis and antrum pains because of the success often attained in seeking relief from these complaints. In bursitis, I depend on very heavy doses of ultraviolet light. In antrum pains, I employ all three modalities.

REPORT OF CASES

CASE 1.—*Referred Pain.*—Mrs. W. B., aged 25, complained of intermittent pain in the right infra-orbital region accompanied by twitching of the muscles. The muscles around the nose were contracted during the spasm. Examination showed a subacute abscess of the lower right first bicuspid. Extraction revealed a distended granuloma containing pus (staphylococcus). All symptoms immediately disappeared.

CASE 2.—*Thermal Pain.*—Mrs. F. M., aged 30, in the ninth month of pregnancy, gave a facial reaction to hot and cold

especially affecting the upper left bicuspids and molars and the left side of the face. The pain had persisted for four days and the patient was unable to sleep. The teeth responded to electric and thermal vitality tests. A slight occlusal trauma was adjusted, with negative results. At the next visit, a quartz lamp was applied to the teeth, jaws and face, with complete relief the next day, and no recurrence.

CASE 3.—*Thermal Pain.*—Mrs. K., aged 31, had a vital lower left cuspid that reacted to heat. A quartz lamp was applied to the teeth and jaws around this area and to the face and, one week later, the patient reported that she could drink hot liquid without discomfort. Three months later, there had been no recurrence.

CASE 4.—*Neuralgia.*—Mrs. M., aged 51, complained of a pain resembling toothache, in the lower right jaw and cheek, of several weeks' duration. She felt as if she had a toothache in the lower right second bicuspid and first molar areas although these teeth had been extracted three months previously. Ultraviolet light was applied to the right jaw and cheek and the tissues about the mental foramen were stretched. Three days later, the patient reported that she was entirely free from pain. There has been no recurrence in three years.

CASE 5.—*Neuralgia.*—Mr. J. O., aged 43, early in November 1940 had a very sharp pain affecting the left side of the tongue, increased when he was eating. November 22, he had the lower left impacted molar removed. He had no relief until the second week in December, when the pain suddenly disappeared.

January 25, 1941, he came under my care. He had had a recurrence of the pain and could obtain relief only through constant use of codeine. The pain traveled along the course of the lingual nerve from the third molar region forward. The teeth were not sensitive to percussion. X-ray examination revealed two roots of the extracted third molar remaining in the socket, one of them lying in the mandibular canal. The infrared lamp was applied to the left side of the face for twenty minutes at about 18 inches. This was followed by diathermy for seven minutes, and next the ultraviolet rays were applied to the local affected parts through a quartz rod, as previously described. The tissues around the lingual nerve were lightly manipulated. It was decided that if no relief was obtained in a few treatments, the remaining roots in the lower left third molar socket would be removed.

February 5, after a period of complete relief, the pain recurred. The patient was in a city 90 miles away and the pain returned while he was brushing his teeth. He immediately came back to my office and had the treatment repeated.

February 6, he reported taking one codeine tablet, to "play safe." At breakfast, he was slightly bothered, but could eat. The treatment was repeated, but in larger doses.

February 19, the patient reported three mornings of pain lasting from one to one and a half hours. The treatment was repeated.

May 1, the patient reported no recurrence of pain to date.

CASE 6.—*Postoperative Neuralgia.*—Mr. R. G., aged 25, had a lower left impacted molar removed April 23. The extraction was followed by dull, but occasionally sharp pains in the wound, face, temple region and head.

April 24, the area was washed out and a sedative inserted, but with no relief.

April 25, the patient first came to see me, with a history of having had no sleep or relief from pain. Infrared, ultraviolet and diathermy, given as heretofore described, afforded some relief.

April 26, the patient reported almost complete relief. The treatment was repeated.

April 27, relief was complete and the patient was discharged.

CASE 7.—*Postoperative Neuralgia.*—Mrs. G. C., aged 30, had a lower left second bicuspid with an acute abscess extracted and three hours later developed a severe pain. Her dentist treated her for three days, applying powerful analgesics to the socket, but the treatment helped for only a short time. The patient took boxes of sedative pills during this time. She was referred to me and I applied infrared, and ultraviolet light, using the basic technic described. The patient felt better that night, but the pain returned in the morning. The treatment was repeated, with complete relief.

CASE 8.—*Postoperative Neuralgia.*—Miss W., aged 31, had had the upper teeth extracted by her dentist three weeks before.

She later developed severe pain over the left infra-orbital region. Great quantities of sedative pills were consumed, with no results. The patient was very irritable and practically exhausted physically. Infrared and ultraviolet radiation were given as previously described and, four days later, great improvement was reported. The treatment was repeated. Three days later, there had been no recurrence and the patient was discharged.

CASE 9.—*Atypical Neuralgia.*—Mr. F. W., aged 33, seen November 30, 1936, reported a continuous dull pain present for the past seven years and affecting the lower left jaw from the third molar region to the mental foramen. At times, the pain became sharp. There was a constant roaring in the left ear. An impacted third molar and devitalized second molar were removed, with no results. Five treatments were given with the infrared light for twenty minutes at 18 inches. The ultraviolet light was applied with a quartz rod for ten seconds at each point and the face exposed to the direct rays. The tissues around the mental foramen were manipulated. The result was a complete recovery.

In December 1939, the patient reported that, three weeks before, the pain had gradually returned. It was especially severe while he was chewing. The roaring returned to the ear. Five treatments with the infrared and ultraviolet lamps, as previously described, were given, with the addition of diathermy 3,000 milliamperes for ten minutes. The symptoms cleared up and the patient was discharged.

CASE 10.—*Atypical Neuralgia.*—Mrs. D. C., aged 40, had had pain in the right antrum and infra-orbital region for the past four years. Two years previously, she had had an abcessed tooth in the upper right jaw removed with some relief for one month. A year previously she had had all of the upper teeth extracted to relieve the pain. She felt better for about a month, but the pain recurred. Three infrared and ultraviolet treatments were given, to the jaw and face on the affected side according to the described technic. The tissues about the infra-orbital region were massaged and stretched. The patient was entirely relieved and was discharged.

CONCLUSION

I have attempted to classify the various neuralgic pains which the dentist occasionally encounters, and which do not respond to drug therapy or the usual armamentarium found in his office. Several forms of physiotherapy have been mentioned that may be used with success in alleviating these conditions.

A search of the dental literature gives little or no information regarding the treatment of these cases. There may be better and shorter methods of handling them which the publication of this paper may bring to light.

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PERIAPICAL FIBROMA: ROENTGENOLOGIC OBSERVATIONS

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THE lesion referred to as periapical fibroma is a benign tumor that has its origin in the periodontal membrane. In the roentgenogram, it is seen as a fairly well defined radiolucent mass adjacent to the roots of the tooth or teeth. In most instances, this type of fibroma has proved to be the first stage in the development of a cementoma.

It is only within relatively recent years that the cementoma has been recognized as a definite pathologic entity. In 1931, Dewey gave an excellent description of a case of cementoma; and since it has been more generally recognized, the lesion has proved to be one of the most common neoplasms of the jaws. In 1934, I reported a series of cases in which masses of connective tissue had developed at the root ends of vital normal teeth as the result of proliferation of the connective tissue of the periodontal membrane.

In a study of microscopic sections obtained in several cases, and by roentgenographic examination made in other cases during the course of development of the neoplasm, it was noted that, in most instances, cementicles formed in the connective tissue to such an extent that cementum almost completely replaced it. The result was a mass of radiopaque cementum that remained separated from the surrounding bone by a layer of connective tissue. The translucent layer of connective tissue around it produced on the roentgenogram an image so characteristic that a reliable diagnosis could be made readily from the roentgenographic evidence. A common feature was the tendency for the lesion to appear about several teeth in the same person. The multiple occurrence of cementoma is shown in Figure 1.

Attention also was called to the fact that, in some instances, like cementum developed in the original fibrous mass, and that the mass remained indefinitely a translucent region, which, when seen in the roentgenogram, could be confused with a dental granuloma or cyst. For this stage of the lesion, Thoma has suggested the term cementoblastoma.

On the basis of roentgenographic observations in cases in which patients have been seen over a period of several years, it appears that, in rare instances, little if any cementum develops in the fibrous mass which has formed, but that the fibrous tissue is replaced with what appears to be normal bone, so that no evidence remains of what actually has taken place. This phenomenon was first observed in multiple occurrences and when definite cementomas developed in other teeth involved. Since the evidence in the early stages of development was similar, it may be assumed that this early stage involved the same pathologic process, but that it varied only in the end-results. In other words, after the formation of the original fibrous mass, further development may follow one of three courses: (1) most of the fibrous mass may be converted to cementum; (2) it may remain as a cementoblastoma or fibroma for an indefinite period, or

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(3) it may be replaced by bone. It has been shown that, as is true in the periodontal membrane, the mass of fibrous tissue contains osteogenic cells, which may produce both normal bone and cementicles; that is, both osteoblasts and cementoblasts. If activity of the osteoblasts is predominant, the fibrous mass may be converted into bone, and that this takes place is, on the basis of roentgenographic observations, highly suggestive, since the calcified tissue that has replaced the fibrous tissue has the roentgenologic appearance of bone. Three cases have been selected to illustrate this course of development.

Fig. 1.—Multiple occurrence of cementoma on teeth of lower jaw.

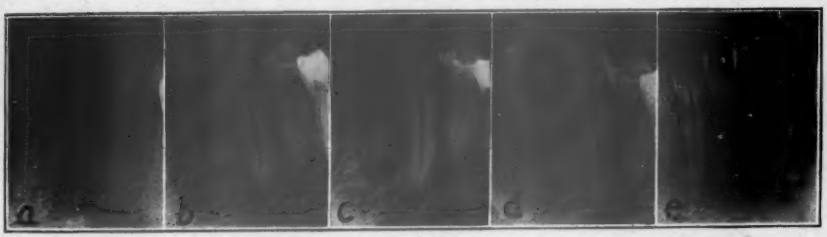

Fig. 2.—Steps in development and resorption of periapical fibroma on lower right lateral incisor in Case 1. a, November 1, 1933; b, March 21, 1935; c, January 4, 1937; d, December 21, 1937; e, December 27, 1940.

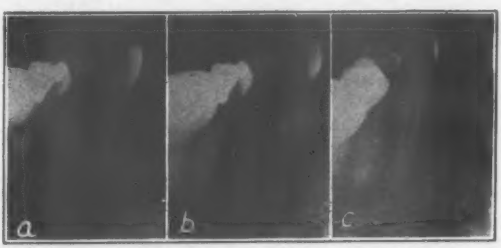

Fig. 3 (Case II).—Periapical fibroma in lower first premolar that has been converted to bone, and another that has appeared on lower central incisor tooth. a, April 10, 1930; b, March 30, 1939; c, December 19, 1941.

REPORT OF CASES

CASE I.—A man, aged 39, had dental roentgenograms made, November 1, 1933. Roentgenograms were made at various intervals thereafter, over a period of seven years, and the lesion was seen to involve a lower right lateral incisor (Fig. 2, a, b, c, d and e). The first (Fig. 2, a) and the last (Fig. 2, c) roentgenograms were normal, but,

during the intervening time, the lesion had appeared and disappeared. During that period, there had been no discomfort associated with the tooth, which had been free from caries and of normal color, and had responded normally to tests for vitality.

CASE II.—A woman, aged 46, came in for a dental examination in April 1930. Roentgenograms revealed a radiolucent mass of tissue adjacent to the root of a lower left first premolar. (Fig. 3, a.) When a roentgenogram was made in March 1939, it was found that the radiolucent mass that had been noted on this tooth in 1930 could no longer be seen. (Fig. 3, b.) A roentgenogram made December 19, 1941, is shown in Figure 3, c. The first premolar, which previously had been involved, was still normal; but there was evidence that a similar periapical condition had now developed on the left lower central incisor. The lower incisors are those with which these tumors are most frequently associated, and the condition that was now present on the central incisor was roentgenographically typical of the first stage of cementoma. Because of the above-mentioned tendency of this lesion toward multiple occurrence, it can be assumed that the condition that had been present on the first premolar eleven years previously was similar, but that, instead of the formation of cementum, conversion of the fibrous mass to bone occurred. It will be of interest to note what course the lesion on the incisor tooth will take when roentgenograms are made in the future. In this case, as in others, the patient was unaware of what was taking place, and both teeth were clinically normal and sound.

CASE III.—A woman, aged 35, first seen June 21, 1937, had complete dental roentgenograms made during the course of a general physical examination, at this time and at later periods. (Figs. 4 and 5.) The roentgenograms made at the patient's first visit disclosed well-defined radiolucent tissue adjacent to the roots of the upper right canine, lower right first molar and lower right first premolar and first molar. (Fig. 4, a.) The canine is shown in Figure 5, a. The involved teeth were free from caries, and, with the exception of a mild degree of mottling of the enamel, were otherwise normal. The general physical examination had disclosed that the patient was in excellent health.

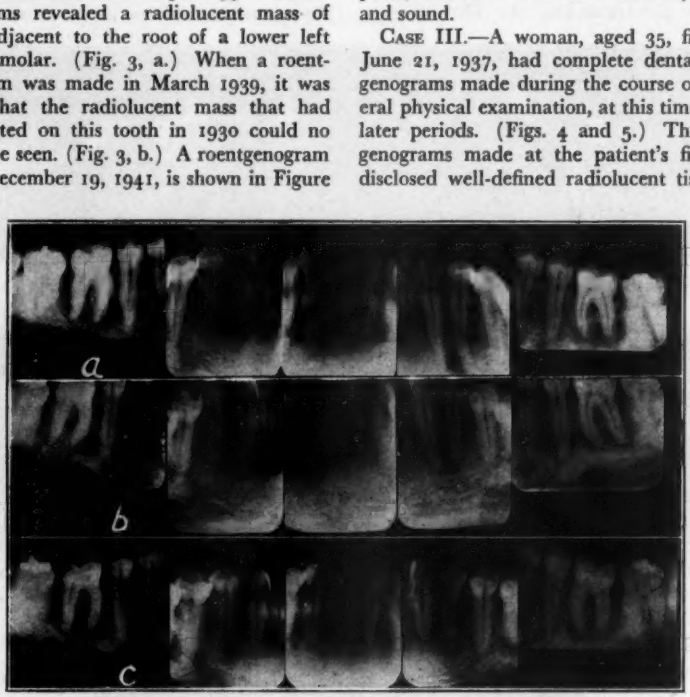

Fig. 4 (Case III).—Roentgenograms made: a, June 21, 1937; b, May 24, 1939; c, January 12, 1942.

Dental roentgenograms were made again May 24, 1939. (Figs. 4, b and 5, b.) The most striking change that had taken place since the examination two years previously was the disappearance of the radiolucent

tissue in the apical region of the upper right canine and complete return of the tooth to a normal condition. On the lower right first premolar, the radiolucent periapical mass had decreased appreciably in size, but was not totally obliterated. During the same period, masses of radiolucent periapical tissue had appeared on the lower left lateral incisor and canine, and the lower right central incisor. In view of the apparent active resorption and apposition of bone that was taking place, the patient was referred to the clinical laboratory for determination of values for serum phosphatase and phosphorus. The value for phosphorus was 3.5 mg. per hundred centimeters of serum, and that for phosphatase was 2 Bodansky units per hundred centimeters of serum. These values are within normal limits.

Dental roentgenograms made September 6, 1940, revealed a decrease in size of the

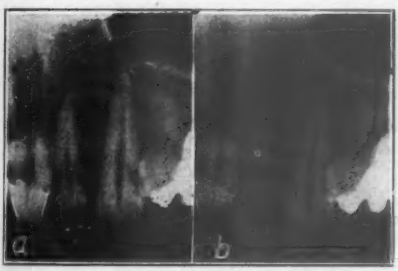

Fig. 5 (Case III).—Roentgenograms of upper right canine made: a, June 21, 1937; b, May 25, 1939.

periapical mass of radiolucent tissue associated with the lower anterior teeth and the lower right first premolar. These roentgenograms are not reproduced herein, but one that was made January 12, 1942, is shown in Figure 4, c. The radiolucent periapical regions that had been present on the lower left lateral incisor and canine and the lower right central incisor had now completely disappeared. In other words, the periapical mass of connective tissue had been converted into bone.

CEMENTICLES IN FIBROUS EPULIS

Another neoplasm that often has its origin in the periodontal membrane is the simple fibrous epulis. Since, in some instances, the fibrous tissue of the epulis is derived from the same source as cementoma, the tendency toward development of cementicles may also be observed in this lesion. Such an occurrence has been reported in the literature of Rywkind, who observed cementicles in a simple epulis in which bony spicules also were present. The cementicles were single and scattered in the tissue.

With this in mind, microscopic sections of several epulides were studied, and one removed from the lower jaw showed, near its base, spicules of bone and several cementicles. A part of the lesion that contained cementicles is shown in Figure

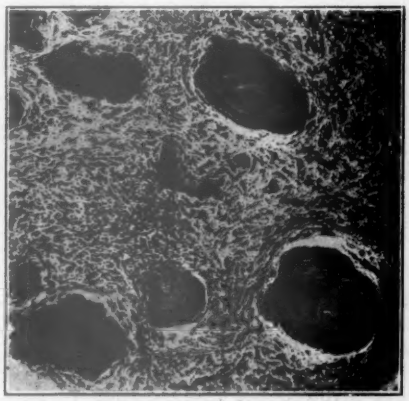

Fig. 6.—Section of fibrous epulis, showing cementicles. (×190.)

6. Such cementicles have, no doubt, often been encountered in microscopic sections from this source and probably have been thought to be bone. How frequently they occur can be determined only by thorough examination of a large series of tumors.

CONCLUSIONS

A periapical fibroma that develops as a result of proliferation of connective tissue from the periodontal membrane may follow three courses: (1) most of the fibroma may be converted to ce-

mentum; (2) the lesion may remain as a fibroma or cementoblastoma for an indefinite period, or (3) it may be completely replaced by bone. The bone that replaces the fibroma apparently does not exhibit the same neoplastic activity as does the bone in central osteofibroma of the jaws, which is derived from other sources.

Periapical fibromas and some fibrous epulides are in a measure similar, in that they both have the tendency or ability to form cementicles. However, in the periapical fibroma, the formation of cementum is a dominant feature, whereas, in the epulis, such formation occurs but rarely.

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COMPARISON OF CARIES PREVALENCE BETWEEN FRESHMAN STUDENTS IN TWO MIDWESTERN UNIVERSITIES

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DENTAL caries has been studied by both experimental and clinical procedures in an effort to control this most common malady of civilized peoples. One of the clinical procedures has involved the accumulation of data by examination of the mouths of large groups of people. It is thought that, by this means, a correlation of caries prevalence with age, sex, race, nutritional habits, occupation, geographic location and social standing would provide important information concerning its etiology and spread. These conditions can, in all probability, be most satisfactorily designated as secondary or contributory causes in a consideration of the actual mechanism of dental caries. However, by the use of such statistical studies, we can gain an insight into the type of individual most susceptible to dental caries and the environmental conditions under which this disease operates most effectively. The type of study familiarizes us with the epidemiologic aspects of caries and, in this way, inquiry regarding the possibility of developing better methods for its control is encouraged. Some significant and valuable contributions providing us with knowledge concerning the frequency and spread of dental caries in recent years have been made by Brekhus, [1,2] Cheyne and Drain,[3] Driak,[4,5] Klein and Palmer,[6,7] Klein, Palmer and Knutson,[8] Montelius,[9] Sloman and Sharp,[10] Sprawson,[11] Stoughton

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and Meaker[12] and the extensive survey conducted by the United States Public Health Service in 1933-1934.[13]

Unfortunately, all of the data reported on caries prevalence are not in agreement regarding common essential points. One of the most frequent causes for variation between reports is individual differences in examining and recording. For that reason, it should be the objective of those interested in this phase of the caries problem to establish a base line or standardized procedure for tabulating data. This point cannot be too strongly emphasized. The general similarity of available data at the present time, however, is of assistance. Reports that give the relative prevalence of caries between males and females, upper and lower arches, right and left sides of the mouth and the individual teeth afford quite consistent comparisons.

The object of this report is to compare the results of two surveys originally conducted for the purpose of determining the prevalence of dental caries in university freshman students. The surveys were conducted at the universities of Minnesota and Indiana. The most constant factors in the surveys to be considered are age, sex, race, occupation and socio-economic level. It is probable that the students of the two groups were similarly privileged as regards dental care, home environment and nutritional conditions. There is the possibility of variations in locale, but as university students are usually drawn from large areas and do not necessarily offer a representative segment of any part of the country, it is very likely that this is of minor significance. This study, therefore, not only serves to confirm or deny certain findings reported on the etiology and spread of dental caries, but also demonstrates differences by direct comparisons which may occur between groups as a result of individual examining.

TABLE 1.

COMPARISON OF PERCENTAGES OF UNAFFECTED TEETH FOUND IN FRESHMAN STUDENTS AT THE UNIVERSITY OF MINNESOTA (1939) AND THE UNIVERSITY OF INDIANA (1940-41).

	Upper Left							Upper Right						
MALE	7	6	5	4	3	2	1	1	2	3	4	5	6	7
U. of Minn. Number Examined = 2677. / U. of Ind. Number Examined = 2231.														
U. of Minn.	21.56	13.22	57.94	82.47	91.33	71.91	71.72	71.57	71.69	91.30	80.85	55.77	13.14	24.02
U. of Ind.	30.08	15.91	64.37	87.41	91.79	74.98	75.17	75.43	74.98	92.29	88.36	63.87	16.55	31.06
Difference	+8.52	+2.69	+6.43	+4.94	+0.46	+3.07	+3.45	+3.86	+3.29	+0.99	+7.50	+8.10	+2.41	+7.04
	Lower Left							Lower Right						
U. of Minn.	16.74	10.36	64.18	85.77	97.80	97.31	96.63	96.83	97.43	97.76	85.81	63.29	9.79	17.33
U. of Ind.	19.23	10.04	71.67	88.79	98.39	97.71	96.77	96.86	97.72	97.86	89.33	70.46	12.16	20.17
Difference	+2.49	+0.32	+7.49	+3.02	+0.59	+0.40	+0.14	+0.03	+0.29	+0.10	+3.52	+7.17	+2.36	+2.84
FEMALE														
U. of Minn. Number Examined = 1671. / U. of Ind. Number Examined = 1003.														
U. of Minn.	18.26	14.78	82.17	89.71	97.73	71.33	68.10	68.64	73.25	88.45	88.65	80.08	10.17	17.60
U. of Ind.	28.42	9.07	88.83	90.92	94.32	77.01	73.28	73.88	76.97	94.12	82.71	58.52	10.47	25.32
Difference	+10.16	-5.71	+6.66	+1.21	-3.59	+5.68	+5.18	+5.24	+3.72	+5.67	-5.94	-8.44	+0.30	+7.72
	Lower Left							Lower Right						
U. of Minn.	11.60	8.01	89.07	84.32	98.07	97.78	97.78	97.72	98.08	98.20	85.87	60.02	8.61	14.12
U. of Ind.	22.83	6.58	88.03	87.04	98.31	97.81	97.81	97.91	98.31	98.60	89.23	64.41	7.18	20.54
Difference	+11.23	-1.43	-1.04	+2.72	+0.24	+0.17	+0.03	+0.19	+0.23	+0.40	+3.36	+4.39	-1.43	+6.42

SOURCE AND TABULATION OF DATA

The data on the students at the University of Minnesota were obtained in

1939 and reported by Brekhus in 1941.[2] The data on the students at the University of Indiana were obtained from the records of mouth examinations made in conjunction with a general physical examination required of all persons entering the university in 1940 and 1941. (No distinction is made between "freshman" and "entering" students in the Indiana survey. The relative number of students not entering as first year students, however, is small, and except for minor differences in age, in all probability, can be considered insignificant. A sufficient number of cases are present in the actual freshman classification to allow this assumption.) The results of the examination for these two years were combined, in order to make a group comparable in size to that of the survey conducted at the University of Minnesota.

The methods employed at Indiana University in gathering the information on caries followed a "standardized procedure" as closely as possible. The prevalence of caries was recorded by tabulating decayed, missing and restored teeth; i.e., DMF teeth. (Bodecker[14] and Klein and Palmer[15] have advocated simplified methods for the tabulation and evaluation of caries data. We have followed the method of Klein and Palmer in this study as nearly as possible. Modifications have been necessary, however, so that our data could be compared with those reported at the University of Minnesota. Klein and Palmer use the DMF designation for purposes of precision and brevity. The designation is one of the most dependable means of dental caries measurement at the present time. In using the term, the complete caries experience of the individual can be expressed. The expression, however, presumes that all missing teeth were lost because of caries and that all filled teeth had undergone decay at one time. It is applicable only to permanent teeth.)

The examinations were made by members of the clinical staff of the dental faculty under adequate artificial light. The armamentarium consisted of dental mirrors, sharp explorers, tongue depressors and air syringes. Experienced assistants were provided for recording observations so that the examiners could confine their undivided attention to the oral cavity. Diagrammatic charts with each tooth clearly designated were used. Observations were made on all teeth present in the mouth except the third molars. A tooth was considered carious if the explorer caught in softened enamel or dentin and there was macroscopic evidence of a lesion. The extent and severity of attack in any single tooth were not

TABLE 2.—COMPARATIVE SUMMARY OF CARIES DATA

		University of Minnesota	University of Indiana
Number of students examined		4348	3234
Average age		18 years	19.16 years
Number of affected teeth per person		11.08	10.12
Percentage of unaffected mouths		1.17	3.22
Percentage of right and left teeth affected	Male	38.9 - 38.7	32.3 - 35.6
	Female	40.8 - 41.1	37.3 - 38.3
Percentage of upper and lower teeth affected	Male	44.4	40.0
		33.1	31.0
	Female	47.5	42.9
		34.4	32.9
Percentage of affected teeth	Male	38.8	35.5
	Female	41.0	37.8

evaluated. Full crowns were considered placed because of caries unless the patient stated otherwise. Residual roots were considered a sequela of caries.

COMPARISON OF DATA

Table 1 represents the manner of arranging and comparing the collected data. The table includes the caries findings in 2,677 boys and 1,671 girls at the University of Minnesota, and 2,231 boys and 1,003 girls at the University of Indiana. The average age of the 4,348 students comprising the groups at the University of Minnesota was 18+ years. The average age of the 3,234 students in the combined group at the University of Indiana was 19.16 years.

The figures as tabulated offer a general comparison between the percentage of unaffected individual teeth found in (1) the right and left sides of the mouth, (2) the upper and the lower arches and (3) the male and the female sex. The percentage of individual teeth unaffected by caries at each university, i.e., those having no DMF stigmata, is represented in Table 1 by the figures under the number indicating the respective tooth positions in the mouth. Differences are expressed as positive or negative figures. The number is positive when the percentage of unaffected teeth of the Indiana students exceeds that for the Minnesota students. It is negative when the percentage at Minnesota is higher. At the University of Minnesota, the average number of DMF teeth was 11.08 per mouth; at the University of Indiana, the number was 10.12. The latter figure represents the sum of 1.97 untreated carious teeth, 1.02 missing and 7.13 restored teeth per mouth. Among the Minnesota students, 1.17 per cent of all the mouths examined were found to be perfect, or free of DMF teeth; while among the

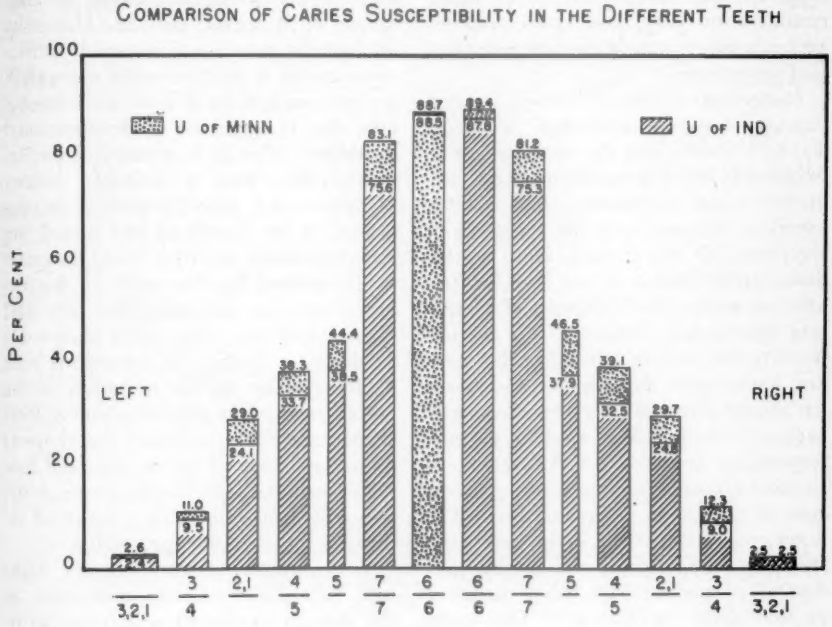

Figure 1.

Indiana students, 3.22 per cent of all the mouths were free of DMF teeth.

A comparison of the figures on affected teeth at each university, as well as those on mouths free of caries, reveals the fact that the Indiana University students were in a better dental condition. Apparently, however, this difference is due to individual examination procedures. Sloman's figure for caries frequency in the teeth of 18-year-old high school students is 8.4. This is lower than the figure for caries frequency in either of the groups under consideration here, and again probably presents differences due only to examination procedures.

Inspection of the differences in percentage between individual teeth in Table 1 shows that the male group at Minnesota had less unaffected teeth, i.e., greater caries prevalence, than did the group at Indiana, with the exception of the lower left first molars. Here the Indiana group had 0.32 per cent less unaffected teeth. The University of Minnesota figures show, however, that the upper left first molars, lower left first molars, lower right first molars and lower left second bicuspids were less frequently carious in the female group than the corresponding teeth of the University of Indiana group by the respective percentages of 5.71, 1.43, 1.43 and 1.04. The lower cuspid in both sexes was least frequently affected by caries, the percentage of perfect ones being the same as that given by Cohen.[17] The lower first molar was the most frequently affected. This is in agreement with the statistical studies made by Hyatt,[18] as well as those of Cohen, which show that the lower first permanent molar is the tooth most liable to attack by caries. Cohen stated that approximately 80 per cent of the lower first permanent molars are defective by 10 years of age. Cheyne and Drain,[3] in their studies of permanent tooth loss in children, stated that, although all first permanent molars contribute more than 88 per cent to the total loss, the lower first molars alone contribute 65.8 per cent.

The various groups of teeth in the human being are subject to caries in different degrees. Figure 1 gives a comparison of this relative caries susceptibility. In this figure, the teeth are grouped in the manner suggested by Brekhus.[1] The teeth represented in each column are designated by the symbols below the columns. The percentage of susceptibility in the groups range from 2.4 to 89.4. For convenience of comparison, the University of Minnesota data and University of Indiana data are superposed. Differences noted in relative caries susceptibility between groups of teeth are undoubtedly due to anatomic or developmental variables. The first permanent molars erupt early, bear a multiple number of fissures and, with the unhygienic conditions in the mouth at this period, are especially liable to caries. That the caries nearly always has its onset on the occlusal surfaces indicates that pits and fissures are the areas most vulnerable to decay, a finding in agreement with Hyatt's.[18] The relative immunity of the cuspids and lower incisors is due to their shape and the constant mechanical cleansing action of the tongue and lips. Differences between similar groups at the two schools are probably a result of individual examination procedures.

1. *Prevalence of Caries in the Right and Left Sides.*—Caries prevalence in the mouths examined was found to be approximately bilaterally equal in the boys and girls at both universities. (Table 2.) In general, this finding is in conformity with that of other reports. Driak[4] believes the incidence to be slightly higher on the left side, but it has been shown that the difference is not significant beyond the probable error of observation.[5] In Minnesota students, the similarity is reflected by the figures which show that, in the boys, 38.9 per cent of the right teeth and 38.7 per cent of the left teeth were affected, and, in the girls,

40.8 per cent of the right teeth and 41.1 per cent of the left teeth were affected. In the Indiana survey, 32.3 per cent of the right teeth and 35.6 per cent of the left teeth of the boys were affected, and 37.3 per cent of the right teeth and 38.3 per cent of the left teeth of the girls were in a similar condition. The greatest differences in these comparisons occurred in the Indiana male group. It is probable that the difference in this one group, however, is more apparent than real. The close similarity between the right and left sides is also clearly demonstrated in Figure 1.

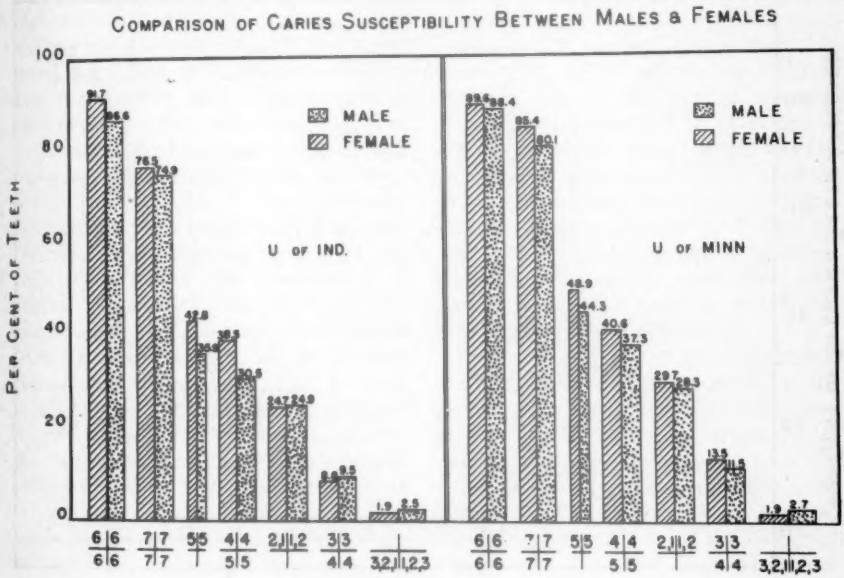

Figure 2.

2. *Prevalence of Caries in the Upper and Lower Arches.*—The reports of Cheyne and Drain,[3] Cohen[17] and Driak[4] state that total caries is less prevalent in the lower arch than in the upper. The data compared in the present study for each sex group are in agreement with these reports. (Table 2.) In the Minnesota male group, 44.4 per cent of the upper teeth and 33.1 per cent of the lower teeth were affected. In the female group of the former university, 47.5 per cent of the upper teeth and 34.4 per cent of the lower teeth were affected, as compared with 42.9 and 32.9 per cent. Even the high prevalence of caries in the lower first and second molars could not overcome the relative immunity of the remaining lower teeth, particularly that of the incisors, cuspids and first bicuspids.

3. *Prevalence of Caries in Males and Females.*—During the last decade, numerous and conflicting reports have been made on the comparative prevalence of caries in the two sexes. Brekhus,[1] Cheyne and Drain,[3] Klein and Palmer,[6, 15] Klein, Palmer and Knutson,[8] Sloman,[16] Sloman and Sharp,[10] Sprawson[11] and Stoughton and Meaker[12] have reported a higher prevalence for females than males at the same chronologic ages. Conversely, however, Cohen[17] and Day and Sedwick[19] observed a higher prevalence of caries in males than in females, while Driak[5]

maintained no sex differences existed.

In Figure 2, the caries prevalence in the male and female groups at each university is compared. These group comparisons indicate that, with the exception of a higher frequency in the first molars of the Indiana University female group, the teeth of the students at Indiana were affected less by caries, in general, than the teeth of the students at Minnesota. This is also evident in Table 2, where it is noted that the total prevalence of caries in teeth of the male groups was as follows: Minnesota, 38.8 per cent; Indiana, 35.5 per cent. The prevalence in the teeth of the female groups was: Minnesota, 41.0 per cent; Indiana, 37.8 per cent.

It is likewise evident from these figures that girls have more caries than boys at each university. This occurs in the Indiana students in spite of a lower average age for girls and is probably due to the fact that the permanent teeth of the female sex erupt sooner and are exposed to the oral environment over a longer period.[20] Frequency of caries is dependent on the length of exposure of the teeth in the mouth, i.e. posteruptive tooth age, so that, beyond this difference, caries apparently bears no relation to sex.[6]

In the University of Indiana survey (Fig. 2), it is observed that the female group had slightly more caries in the posterior teeth and slightly less caries in the anterior teeth than did the male group. In the University of Minnesota survey, the prevalence in the girls slightly

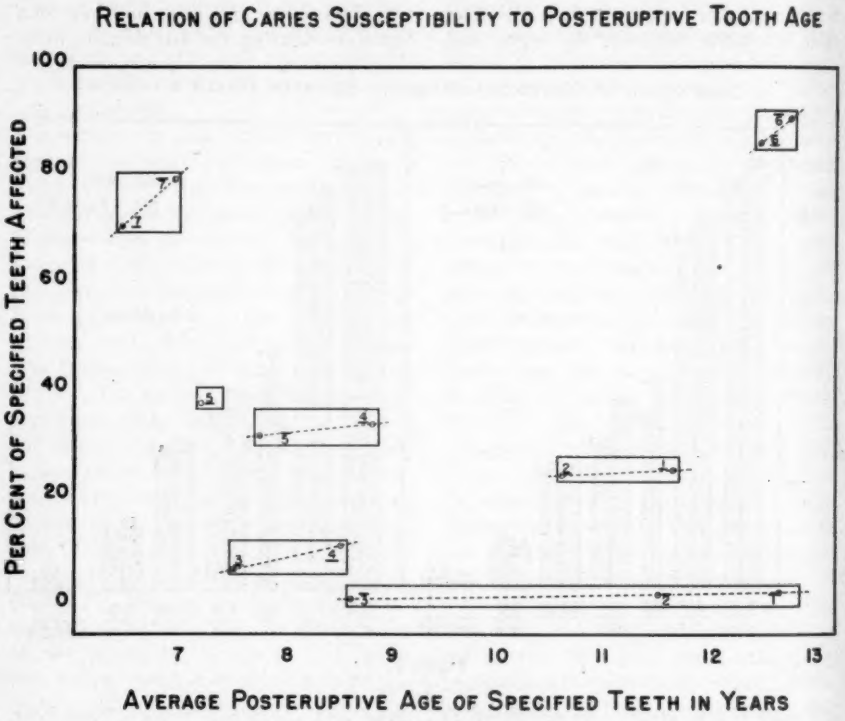

Figure 3.

exceeded that in the boys throughout, with the exception of the lower anterior teeth.

CLASSIFICATION OF CARIES SUSCEPTIBILITY

It is evident that if one compares the degree of caries frequency in individual teeth of Indiana and Minnesota students (Fig. 1), the values fall into the same groups that Brekhus mentioned in his report of an earlier survey at Minnesota.[1] This peculiar grouping was of interest to us, and following the suggestions found in the report of Klein and Palmer,[7] in which they grouped the various morphologic types of permanent teeth according to caries susceptibility and posteruptive age, we attempted to determine to what extent the length of exposure time manifests itself in our grouping. Figure 3 represents the charting of these calculations. Here, the average age percentage of specified teeth affected represents the combined figures for the right and left sides in both sex groups of Indiana University. The average posteruptive age of each tooth was derived from calculations based on an average chronologic age of 19.23 years for boys and 18.67 for girls. The tables of Klein, Palmer and Kramer[20] giving values for the mean eruption time of the permanent teeth were used in estimating the time of exposure of the teeth. Since only single examinations are available and an average age expression employed, the values are plotted as single points for each tooth type. These points are grouped, each group covering a relatively narrow range of caries frequency. The groups are noted to arrange themselves similarly to those plotted in Figure 1.

The findings represented in Figure 3 indicate that there is a consistent difference in caries frequency between morphologically similar teeth in respect to posteruptive exposure time. Each group shows an upward trend in caries frequency with increasing posteruptive age, as indicated by cross lines. However, in spite of nearly equal eruptive ages, incisors and first molars differ widely in their caries frequency. Other factors, therefore, such as structure, developmental influence or position in the mouth, must play more important parts in the carious process and, in the recording of most clinical caries data, undoubtedly overshadow individual differences due to posteruptive age.

SUMMARY

A comparison as to the caries prevalance was made between 4,348 Minnesota freshman students and 3,234 students at Indiana. The compared groups are quite uniform as regards age and sex distribution. In general, the comparisons have shown that although the average age of the University of Indiana group was one year greater than that of the University of Minnesota group, the caries prevalence rate was slightly lower at the former institution. Whether this is due to differences in examination procedures, geographic location or other conditions, we are, as yet, unable to determine.

In a consideration of individual teeth of the students at both universities, the number of affected lower first molars was greatest and the number of affected lower cuspids was least as compared with the other teeth. There was no appreciable difference in caries prevalence between the right and left sides of the mouth at either university. The caries prevalence in the upper teeth exceeded that of the lower teeth by slight margins of difference. For the most part, this difference could be attributed to the relative immunity of the lower incisors and first bicuspid.

Girls had more teeth affected by caries than boys had, at both universities. In general, however, the difference in caries prevalence between boys and girls was not large and probably could be adjusted if posteruptive tooth ages were considered.

A classification of the twenty-eight

permanent teeth on the basis of their caries susceptibility is included in this study. Seven caries-susceptible groups make themselves evident. When subjected to an evaluation which includes the influence of the posteruptive age upon their susceptibility, it is found that there is a relation within the groups, but posteruptive age bears little relation to the general grouping. From this, it is concluded that there are other factors in the relative caries susceptibility of individual teeth.

The data used in this paper were collected by Dr. Claude R. Baker and Dr. William F. Koss in collaboration with the student health service of Indiana University. The authors wish to acknowledge these efforts.

The opinions or assertions contained in this article are the private opinions or assertions of the writer and are not to be construed as official or reflecting the views of the Navy Department or the Naval service at large. —Article 113, U. S. Navy Regulations.

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SIMULATED MAJOR TRIFACIAL NEURALGIA CAUSED BY PULP STONES: REPORT OF A CASE

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DETERMINATION of the cause of facial neuralgia is sometimes difficult. Even a final pronouncement as to whether one is dealing with a major trifacial neuralgia or with a minor facial neuralgia is difficult. Major trifacial neuralgia, or tic douloureux, is, of course, a serious central nerve disease, involving the trigeminal nerve. It is central in origin, being in the main nerve trunks of the fifth nerve, or in the gasserian ganglion. An occasional simulation of true tic symptoms sometimes confuses the diagnosis of a major facial neuralgia. Neuralgiform pains involving the face, head or neck, not genuine trigeminal neuralgia, are called atypical neuralgia.

Minor facial neuralgia that is dental in origin can simulate a true tic douloureux in that the pain may be of a sharp paroxysmal character, and brought on by a slight stimulus or no stimulus. But it is not accompanied by facial muscular contractions as is true tic. Most commonly, minor facial neuralgia is caused by pulpitis, the pain being referred to some region supplied by the fifth nerve on the same side of the head. Stimulation by sudden changes in temperature of the suspected tooth or teeth will bring on the pain. The first complaint may be earache, as the pain seems to radiate from this area supplied by the fifth nerve. After the ear has been examined, with negative findings, the dentist is consulted, to determine whether the pain is of dental origin.

Pulp stones have been designated as the causative agent in some cases of minor facial neuralgia or atypical neuralgia. However, pulp stones may be present with no neuralgic symptoms. When pulp stones are present and there is a minor facial neuralgia on the same side of the head, causes other than dental having been ruled out, it is safe to assume that the teeth with the pulp stones are the causative agents. Pulp stones are usually found where there is deep caries, with probable pupal involvement, usually with no apparent periapical disease. They are also found in teeth in continuous traumatogenic occlusion, or showing abrasion or erosion, and occasionally there is a seeming systemic predilection for their formation. A tooth with a pulp stone has a pathologic pulp that is dead or dying, and this pulpal disturbance causes the neuralgia. The pulp stone may be attached to the wall, the pulp chamber or the canals, or be freely suspended therein.

REPORT OF A CASE

History.—A middle-aged white woman, in good health and active in her profession, had, for several weeks previous to her visit to my office, been troubled with severe paroxysms of pain on the right side of the face, from a point just in front of the ear upward to the right temporal region, down to the angle of the jaw, and also behind the ear to the mastoid region. This pain was brought on by thermal changes in the mouth and also by sudden exposure to external cold, as on entering an air-conditioned room. The pain was very severe, so that the patient involuntarily pressed her hand to the right side of her face and held it there until the spasm subsided, which it did in about ten seconds. Occasionally, there were groups of these attacks, so that the patient had almost continuous pain for periods of two to three

minutes. Light digital pressure on the spot just in front of the right ear elicited the jab of pain. Medical examination disclosed no aural pathosis, sinusitis or any other non-oral possible cause for the pain. The physician prescribed codeine to control the pain, with little success, and dental examination was advised.

Oral Examination.—The oral mucosa and gingivae were normal. The teeth were in good condition, instrument examination revealing only the need for prophylaxis and the presence of two minor cavities, both in teeth on the left side of the lower jaw. The upper right bicuspid and both lower second bicuspids were missing.

Examination of the teeth on the upper right side disclosed the fact that all were sound and unfilled except the first and second molars. There was no third molar. The gingivae surrounding these molars were healthy. Slight calcular deposits were noted. Percussion test revealed no pericementitis. Both teeth were vital to thermal stimuli. This test brought on a painful paroxysm lasting about five seconds, the patient's face becoming screwed up as if in intense pain while she pressed her hand to the right side of the face and temporal region.

The first molar showed a large distoclusal synthetic porcelain filling. The history of the tooth, as given by the patient, was of treatment of a deep cavity fifteen or more years previously, the dentist explaining that he was trying to save the tooth. That there was no cement base in the cavity was discovered later. The cavity was extremely deep, extending to the area normally occupied by the pulp. The tooth had caused no trouble from the time that it was first treated until the present. In the second molar was a medium-size mesioclusal amalgam filling with no cement base. There were no new cavities in either of these two teeth.

X-Ray Findings.—Periapical x-ray films were taken of both the upper and the lower teeth on the right side. The lower teeth showed no pathosis. The upper second bicuspid was normal. Both of the upper right molars showed distinct, well-formed pulp stones situated in the pulp chambers of both teeth. There was no sign of periapical involvement. There was no third molar present.

Diagnosis.—Minor facial neuralgia or atypical neuralgia caused by pulpitis of the upper right first and second molars was the diagnosis, the pathologic condition being evidenced by the presence of pulp stones in these particular teeth.

Treatment.—The two upper molars were removed surgically, the buccal plate of bone covering these teeth being completely removed first. The teeth appeared to be anchylosed, and were removed with difficulty. The bone was smoothed and the toilet of the socket completed before suturing of the flap. Healing was uneventful, with almost no postoperative pain.

Comment.—The paroxysmal pain complained of before has not returned since the removal of the teeth, and all other neuralgic symptoms have disappeared. On being informed of the presence of pulp stones in the upper right molars, the patient said that she had had "stones" in the upper left molars,

Pulp stones in pulp chambers of both molars.

and the teeth had been removed. There was never any sign of neuralgia on the left side.

Pathologic Data.—The two molars were opened and found to contain two large pulp stones, calcified oval masses in the pulp chambers.

CONCLUSION

1. Minor facial neuralgia or atypical neuralgia may simulate a true major trifacial neuralgia.

2. Cessation of neuralgic symptoms after elimination of a dental pathosis disproves the presence of a true tic.

3. Pulp stones are usually found in teeth the pulps of which have become pathologic. The pulpitis is usually due to deep caries, traumatogenic occlusion, abrasion or erosion.

4. The presence of pulp stones may result in facial neuralgia simulating a true tic. Removal of the teeth will eliminate the neuralgic symptoms.

5. The presence of pulp stones in teeth causing symptoms of pathosis does not call for removal of the teeth.

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THE DIFFICULTY OF COMPLETELY REMOVING SUBGINGIVAL CALCULUS

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THE purpose of this paper is to show the difficulties with which the periodontist is faced and the great skill and patience necessary for the successful treatment of periodontoclasia.

Salivary calculus and gingival inflammation have long been linked clinically as cause and effect. The proof of this statement lies in the fact that after the removal of the calculus and instructions to the patient regarding proper brushing technic, an apparent cure results. The gingival tissue resumes its normal pinkness and becomes closely adapted to the cervices of the teeth, and "bleeding" disappears. The word "apparent" is emphasized because recurrence of the inflammation is frequent. This recurrence is explained on the basis that new calculus has formed, reestablishing the previous irritation. Consequently, the gingivae suffer the same inflammatory reaction. The advocated procedure is, therefore, to remove the calculus at frequent intervals and instruct the patient in a brushing and massage technic that will at least reduce calculus formation. This treatment retards periodontoclasia, and a great many persons have retained the teeth as comparatively healthy functioning units for a far longer time than if no treatment had been instituted.

It is believed, however, that root curettage does not always bring about a real cure of periodontoclasia. Evidence supporting this statement will be given later.

Formerly, calculus was classified as salivary and serumal calculus. Now it appears that the origin of both types is the saliva, and consequently a new classification has been set up, dependent on its location: (1) supragingival and (2) subgingival calculus.

Supragingival calculus, as the name implies, is deposited principally on the exposed cervices of the teeth. Its removal is easy, and the dental hygienist can accomplish it readily. If this is the only calculus, as it is in many cases, recovery of the inflamed gingivae is exceedingly rapid. Subgingival calculus, however, is more difficult to remove as it is lodged in the depths of gingival "pockets." The operator feels with satisfaction that he is attacking the real cause of gingival inflammation when he removes these minute black granules by skilful scaling. The point that we wish to raise is: Can calculus always be re-

Prepared for the Section on Periodontia of the American Dental Association, 1942.

From the Division of Oral Histology, School of Dental and Oral Surgery, Columbia University.

Fig. 1.—Mesiodistal section of mandibular central and lateral incisor. Because the tissue block was decalcified, the enamel is lost and the shrunken remnants of the supragingival salivary calculus (SC) are dislocated. The gingival crevice is seen as a white line running down to the subgingival calculus (SC'). AC, crest of alveolus. (×10.)

Fig. 2.—Section shown in Figure 1 with a superimposed No. 10 ivory file magnified 10 diameters. The gingival tissue must be dislocated to a considerable extent to reach the site of the subgingival calculus (SC).

Fig. 3.—X-ray film of mandibular central incisor and No. 10 ivory file showing that size of latter is not exaggerated in Figure 2. (×10.)

Fig. 5.—McCall curet (No. 2R).

Fig. 4.—Relative size of ivory scaler (No. G. O. 3) as compared to tooth.

Fig. 6.—Section of proximal area with superimposed No. 10 ivory file. (×25.) The minute deposit (black) of subgingival salivary calculus (SC′) is shown in relation to the file. Epithelium (EP) is seen penetrating in an apical direction.

moved completely from the depths of gingival pockets? The evidence presented in this report suggests that complete removal of subgingival calculus by a routine scaling technic is difficult.

This statement may stress the advantages of surgical treatment of periodontoclasia. Gingival resection allows

easy access to the tooth cervices, so that all calculus can be removed completely and the root surfaces can be polished thoroughly, with a complete eradication of the infection. But gingival resection does not restore the mouth immediately to a normal condition; and this is its disadvantage. The patient is inconvenienced by food retention after meals, due to wide spaces between the teeth, normally filled with gingival tissue. Advocates of this type of treatment maintain that occasionally even this annoying the possible relation of systemic disturbance to periodontal inflammation. In both periodontoclasia and dental caries, the dentist attempts to reestablish normal conditions solely by local treatment. In periodontoclasia, the irritation caused by the calculus is eliminated to a great extent, and the gingival tissue returns to normal. But it appears that the calculus soon forms again, and this local treatment must be repeated at regular and frequent intervals.

Before turning to a description of the

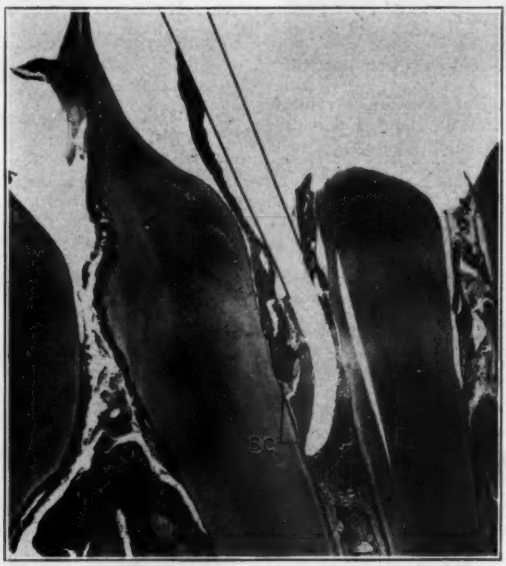

Fig. 7.—Section shown in Figure 1 with a superimposed curet (position incorrect) shown in relation to subgingival salivary calculus (SC). (×10.)

ance disappears. Highly acute and extensive periodontal involvement of the teeth may well be treated by gum resection in case the condition is so severe that routine scaling by an experienced dentist brings no relief.

But another angle is important in the treatment of periodontoclasia: This disease is given purely symptomatic treatment, similar to that of dental caries, because all too little is known concern- illustrations, it is necessary to emphasize the fact that many cases of gingivitis are due purely to a lack of oral hygiene and massage. Many patients are under the impression that they suffer from "pyorrhea" when they notice gingival hemorrhage. If the public were made to realize more generally that proper gingival massage eradicates gingivitis, a great step would be made toward improving periodontal health.

Some of the illustrations (Figs. 2, 6 and 7) present evidence that the removal of all of the infragingival calculus is exceedingly difficult by the routine scaling methods owing to the grossness of the instruments. Examination of pyorrheic teeth under the microscope shows that infragingival calculus is present in exceedingly minute particles (Figs. 1, 2, 6 and 7), in fact so minute that it seemed worth while to compare the size of scalers to tartar deposits. This was not easy, particularly if enlargements of sufficient magnitude were used to make the minute infragingival calculus visible.

The following photographic technic, which has proved successful, shows sections of teeth, periodontal tissues and instruments under linear enlargements of 10 and 25 diameters. This means that each structure visible in the photomicrographs is enlarged 100 and 1,375 times.

The fundamental idea of the technic is to roentgenograph a selected instrument in profile, for instance a No. 10 ivory file. The film is then enlarged 10 times and superimposed on a similarly enlarged photomicrograph of a section of teeth and periodontal tissues. (Fig. 2.) The same technic was employed for the 23 diameters magnification. (Fig. 6.)

When these photomicrographs were shown to colleagues, doubt was expressed as to the correctness of the sizes of the instruments in relation to the tartar deposits. The enormous size of the instru-

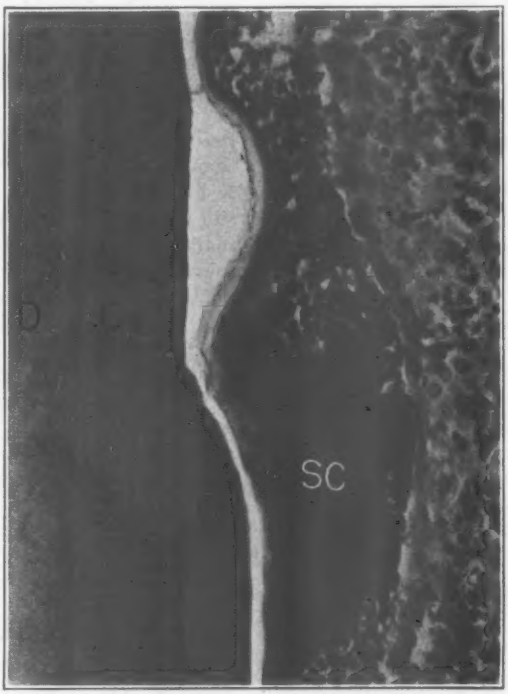

Fig. 8.—Apically situated subgingival calculus seen in Figure 1 (SC'). (×450.) The gingival tissue surrounding the calculus (SC) is inflamed. C, cementum. D, dentin.

ments was astounding. Consequently, roentgenograms were made of the file and two scalers attached to extracted teeth (Figs. 3-5), which show that there is no error in the technic by which Figures 2, 6 and 7 were made.

Photomicrographs of sections of teeth affected by periodontoclasia show that the supragingival calculus can be removed easily (Fig. 1, SC); also that, by expert scaling, most, but probably not all, subgingival calculus can be eliminated. (Fig. 1, SC′.) The question arises: Will not an inflammation of the gingivae return if only a trace of subgingival calculus remains attached to the roots of such teeth? Clinically, the gingivae return to a normal condition after careful scaling, medication and massage by the patient, but it is a common clinical observation that the inflammation recurs after a comparatively short time. Is it not probable that this relapse is due to the presence of remnants of subgingival calculus in the base of the gingival "pocket"? Evidence in support of this statement is presented in Figure 8, which shows a minute remnant of salivary calculus at SC, magnified 450 times, surrounded by a marked round-cell infiltration in the periodontal membrane. It is true that the inflammation of the marginal gingivae does disappear when the supragingival calculus is removed, but minute particles of subgingival calculus, such as are shown in Figure 8, SC, will continue to irritate the periodontal membrane, with a resulting slow spread of the inflammation and finally a relapse.

CONCLUSIONS

The last vestiges of subgingival salivary calculus are exceedingly difficult to remove, as shown by the minute size of the calculus as compared to the scaling instruments. It is possible that this difficulty explains the rapid recurrence of gingival inflammation, and that the surgical treatment of acute periodontoclasia is indicated. The disadvantage of this method of treatment has been pointed out. Consequently, the operator must weigh the advantages of careful, frequent scaling of the teeth, and home treatment by the patient, with those of a radical surgical procedure. One final thought must be borne in mind before making the decision: If the formation of subgingival calculus, which caused periodontoclasia, was due originally to some obscure systemic condition, there is little doubt that, if this condition is still present, calculus will form again, no matter how thoroughly it has been removed. One of the major problems of dentistry is, therefore, to define and control the cause of calculus formation, since its removal is only a purely symptomatic form of treatment.

It is hoped that this report will not be regarded as discouraging the thorough scaling of teeth in the treatment of periodontoclasia. Common experience shows that this technic brings good results even though periodontal recovery is not always permanent. The purpose of this paper is to point out the probable reason for the frequent and early recurrence of gingival inflammations and the fact that skill and patience are necessary for successful results by root curettage in the treatment of periodontoclasia.

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THE TRAINING OF MEDICAL DEPARTMENT OFFICERS IN THE NAVY, WITH PARTICULAR REFERENCE TO THE INDOCTRINATION OF DENTAL RESERVE OFFICERS ORDERED TO ACTIVE DUTY

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THE Manual of the Medical Department states that the Dental Corps is a part of the Medical Department of the Navy, although separate and distinct from the Medical Corps. Under the general duties of dental officers, we read that (1) dental officers are assigned to the medical department of the ship or station to which they may be attached; (2) the professional duties of dental officers are limited to care and treatment of the teeth and surrounding structures; (3) dental officers shall not be called upon to assume any of the professional duties or responsibilities of medical officers. However, a subparagraph states: "Dental officers may be assigned to a battle dressing station and must familiarize themselves with the duties to be performed at such station."

In view of the valuable services rendered by dental officers in battle, as exemplified by their conduct at Pearl Harbor, Coral Sea and Midway and in other recent naval and marine engagements, this paragraph in the Manual has lost its effect, and the training and indoctrination of the dental officer has now become a course in preparation for taking care of casualties in time of battle, as well as covering other general duties.

Prior to Pearl Harbor, the Secretary of the Navy had issued a directive to the effect that all dental reserve officers ordered to active duty be required to attend a regular weekly course of instruction on various military subjects. This instruction is given in the form of weekly lectures or drill periods, and all officers of the grade of commander and below are required to attend. These lectures cover a wide range of subjects and are given by officers who are particularly qualified in that field. Every officer has an opportunity to go out on the rifle range and familiarize himself with the use of the pistol, the service rifle and the machine gun. Officers of the Marine Corps give instruction in close order drill and how to give the various commands. Each officer is expected to familiarize himself with the various toxic and noxious gases, and in the use of the gas mask in such situations.

An extensive swimming program has been instituted at Great Lakes. We have a number of modern and well-equipped swimming pools. Each officer is required to qualify and to be able to swim well the breast, side and back strokes, using each style of stroke for a distance of 50 yards in uninterrupted succession, and one surface dive into the deep end of the pool, recovering an object. Many of our officers have never learned to swim, but they are being trained in swimming

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Read before the Minnesota State Dental Association, Minneapolis, February 17, 1943.

until they can qualify in this final test. Each officer must qualify every month, and failure to do so is called to the attention of the Commanding Officer, through an official report. This program is of great benefit to the officers, not only because it teaches them how to handle themselves in an emergency, but also because it furnishes them with the needed exercise and recreation.

When an officer accepts his commission as a reserve officer, he is required to agree in writing that he will complete two correspondence courses within six months. One of these is a course in Navy Regulations, and the other is in the Manual of the Medical Department. The object of these courses is to familiarize the officer with the general duties of a commissioned officer, with particular reference to the subject matter applicable to officers of the Medical and the Dental Corps of the Navy. It also teaches the officers how to use these manuals for ready reference. No one is expected to memorize the contents of these manuals, but the subject matter is so well indexed and cross-indexed that it covers every contingency which may arise in the performance of official duties.

Aside from these two correspondence courses, the military drill program and the swimming program, the indoctrination of officers is left to the discretion of the Senior Dental Officer.

We do not have a school of indoctrination corresponding to that operated by the Army at Carlisle Barracks, but we do have a school at the National Naval Medical Center, outside of Washington, at Bethesda, Md. This school, which has a limited capacity, is used mainly for the indoctrination of newly commissioned officers in the Navy. Supplementing this, the Navy is ordering a certain number of dental officers to the Mayo Clinic for a course in war surgery.

At Great Lakes, we have instituted our own class instructions in an effort to prepare the officers for independent duty at sea, foreign duty or duty at a smaller shore station. After officers have reported for duty in sufficient number to form a new class, regular instruction periods are given in subjects not covered by any of these other courses. A dental officer in the Navy is assigned as the officer-in-charge and he holds daily classes. A question and answer period following the class instruction serves to clarify any point not covered by the instructor.

Official correspondence is fully covered because, from the time the officer comes to his first duty, he is required to use this method in handling all correspondence, except that of a personal nature. This is so different from civilian usage that it must be stressed again and again in order to avoid the common pitfalls.

The Articles for the Government of the Navy are studied and discussed. These are commonly known in the Navy as "rocks and shoals." All the discipline of the Navy rests upon the basic laws that comprise these articles, and, from them, our Navy regulations and instructions have been derived. These set forth in detail the proper conduct of officers and enlisted men and cover such punishments as desertion and sleeping on watch, both of which are punishable by death in time of war. From this document has evolved our Manual for Courts and Boards. Mock trials are conducted and each officer is required to serve in some capacity in the conduct of a court martial. Such pertinent facts as the convening authority, composition of the court, offenses that may be tried, limitation of punishment and persons that may be tried are all discussed with reference to each type of disciplinary court.

Lectures in naval customs and traditions are given, and these are a part of the unwritten laws of the service. The custom of saluting goes back to ancient days when men raised the right hand to show that they were without weapons. Our enlisted man's uniform is a direct

inheritance from the British Navy, and even the buttons on a midshipman's sleeve cuff were put there for the purpose of keeping the young midshipman from using his sleeve for a handkerchief. The usual honors rendered in reporting on board ship originated in the days of sail. When conferences were held on the flag ships, the weather often necessitated the hoisting of visitors aboard in a boson's chair and the boson's pipe was used to "hoist in" and "avast heaving." We have retained the boson's pipe for that ceremony, but most visitors now manage to walk up the gangway. Many of our naval customs have been abandoned for the duration of the war. One of the first things to go was the officer's badge of office, the sword, which is no longer required as uniform equipment.

The general characteristics and various type of naval vessels are shown by illustrations from "Jane's Fighting Ships." The method of naming ships is discussed so that when a ship makes the news, the mere mention of its name is sufficient to inform the officer of the type of ship in question. The composition of the various fleets and cruising formations are brought out by illustrations on the blackboard. Gunnery practices and the methods used in aiming naval guns are analyzed. Of course, nowadays, there is little gunnery practice as most of the ammunition is being expended against the enemy, but whether in practice or in battle, gunnery is a fascinating subject.

A dental officer may be assigned to other collateral duties, such as ship's service officer, and it is quite an education in itself to be assigned to this duty. It covers the various departments of the ship's service, from operating the barber shop, cobbler shop, soda fountain or laundry, and, of course, showing a profit at the end of the month. An officer may be detailed to duty as a member of an auditing board, or an inventory board, where he must fulfil the duties of a certified public accountant. The following month, he may be elected as mess treasurer of the wardroom mess, and then he takes over the job of catering to the finicky appetities of from twenty to 100 officers. If, after two or three months at sea, the breakfast eggs aren't up to par, that is his headache for the day.

Emergency drills are a necessary part of our training, and each officer has a definite duty to perform when the call is sounded for fire drill, collision drill, abandon ship or general quarters.

At general quarters, the dental officer may be placed in full charge of a battle dressing-station. There, he has a team of hospital corpsmen who are his first-aid men. A party of stretcher bearers collect the wounded, and, if possible, the injured are brought to the battle dressing station for first aid. The men are usually in pain. Morphine must be administered when indicated, especially in all cases involving burns. The dental officer must be able to recognize and treat certain conditions, such as shock, internal injury and hemorrhages, and he must so coordinate his activities with those of the medical department that the men coming under his care shall have better than a fighting chance to return to battle. Strangely enough, the minor injuries are treated first.

Our concept of battle-dressing station organization has been changed somewhat as a result of experience gained by our participation in recent naval engagements. Auxiliary dressing stations, to supplement those regularly prescribed, have been established. Another innovation is the wearing of canvas first aid pouches or vests by hospital corpsmen attached to damage control parties or roving patrols. These additional facilities provide dispersion and make first aid available to more persons, including those on weather decks.

The Medical Department Forms, with which a dental officer is required to be familiar, are taken up in turn, and sample forms are studied in order to fa-

miliarize officers with their use. Various reports required of a dental officer on independent duty are studied and discussed. Some of these reports are in the form of letters, and here again official correspondence forms are very handy.

These classes continue until it is felt that the dental officers are sufficiently indoctrinated to assume an independent detail aboard ship or at a shore station.

As far as the practice of dentistry is concerned, it is no different from that practiced in civilian life, except that there is less trouble in obtaining patients and no worries about where the next ounce of alloy is coming from. We are having the same difficulty that you are in obtaining burs, handpieces and dental equipment, but this bottleneck will be broken very shortly, and these items will become available to us in quantities. Each officer has a trained assistant, and a remarkable amount of work can be accomplished by these officers working under such ideal conditions.

At Great Lakes we maintain a school for the training of dental technicians, with fifty men under instruction for three months at a time. The candidates for this school are hospital apprentices who have finished their courses at the Hospital Corps School and been sent to us for further training as dental technicians. We do not attempt to make laboratory technicians out of them, but train them for duties as chair assistants.

I am not permitted to disclose the number of dental officers now on duty in the Navy, but I can tell you that we have nearly 200 dental officers on duty at Great Lakes. We do not have sufficient equipment for so many officers so we use the "shift" system, thus keeping our equipment in use fourteen hours a day. We are attempting to complete all required dental treatment for our recruits prior to their transfer to sea duty, but, so far, we have been unable to reach this objective. I might say that last year we inserted 253,500 amalgam and silicate fillings, inserted more than 70,000 intermediate bases and extracted 47,000 teeth. I am proud of our dental reserve officers and their contribution to the war effort.

I shall touch but lightly on the physical qualifications for entrance into the Dental Corps of the Navy. Our standards are high; in fact, higher, I believe, than those of any other of the staff corps. There is a reason for this. This is a young man's war, and it has been found that older dentists with physical defects cannot stand up for long under the hardships imposed by duty at sea for long periods, or in battle areas where living conditions are anything but ideal. We have commissioned but few officers over the age of 38, and these were outstanding men in certain specialties and were commissioned for a particular type of duty. We still have a number of inactive reserve officers who have not yet been called to duty, but as equipment becomes available during the next year, they also will be ordered to active duty. Any reserve officer who particularly wishes to go on active duty should make an official request in writing to the Chief of the Bureau of Medicine and Surgery, Washington, D. C., asking for his assignment to active duty. If any of you are interested in entering the Naval Reserve, you can obtain further information at any branch office of Naval Officer Procurement. To those of you who are under 38 and liable to selective service, I urge you *not* to wait until your number is up. Whether you select the Army or the Navy, and whether you are in 1-A or 3-A, prepare now to enter the service within the year.

NOTE.—The opinions and assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

IS CARIES ACUTA TRANSMISSIBLE?

P. H. Belding, B.S., D.D.S., and L. J. Belding, M.D., M.P.H., Waucoma, Iowa

WE have previously discussed the relation of *Streptococcus odontolyticus* (Figs. 1, 2 and 3) to dental caries.[1-4] The following additional experimental data are presented not to prove or disprove any theory, but in the hope that workers with more extensive facilities will check the observations and carry the work to a satisfactory conclusion.

EXPERIMENTAL DATA

Basal Diet.—Control rats in one cage were fed on skimmed milk and oatmeal. Those in three other control cages were fed raw liver twice a week in addition to the basal diet. Oatmeal and separated milk were at all times available in control cages; whereas, in the experimental cages, sucrose was also constantly available in addition to the oatmeal and separated milk.

Cage 1. April 2, 1941, a litter of six rats, born three months previously, were placed in a cage and fed on a diet consisting of separated milk, oatmeal and refined sugar (sucrose). On August 1, colonies of a mucoid variant of *Streptococcus salivarius (S. odontolyticus)* derived from the saliva of a person highly susceptible to dental caries were removed from the surface of a nutrient blood-agar-sucrose culture medium with white bread and introduced into the diet. The procedure was carried out daily throughout August and September. At no time was *S. odontolyticus* recovered from the saliva of the experimental rats twenty-four hours after feeding.

November 1, a female was removed from the cage for a variation of the experiment. The five remaining rats were continued on the oatmeal, separated milk, sugar diet until April 1942. At this time, sugar was deleted from the diet. After nineteen months, though there has been no young that survived, the rats are apparently healthy and no active tooth decay has occurred. (The rats in Cage 1, as well as the control rats [four cages containing a total of sixteen rats] have consistently had relatively high lactobacillus counts as determined by the Michigan method. No active dental caries has occurred in any of these rats.)

Cage 2. November 1, a male rat from one of the control cages and the female from Cage 1 were placed in Cage 2. Raw vegetables, green grass and a small amount of kidney were added to the milk, sugar, oatmeal diet. December 1, a premature litter of six rats made its appearance. All died within forty-eight hours. December 20, liver was added to the diet, and January 11, 1942, a litter of three made its appearance, two males and one female.

Immediately after giving birth to this litter, the mother was placed on a diet consisting of sugar, oatmeal, skimmed milk and a growth of *S. odontolyticus* from nutrient blood-agar-sucrose plates. The saliva of these rats was plated daily. There was some alteration in the flora, but *S. odontolyticus* was never recovered before feeding.

February 11, a new type of streptococcus colony was observed which was at first mistaken for *S. odontolyticus*. This colony was transparent, elevated and hemispherical, with a diameter that seldom exceeded 0.5 mm. The morphologic appearance of the individual cells was very similar to that of *S. odonto-*

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lyticus.[1] In contrast to *S. odontolyticus,* however, the colony was of firm consistency and tenaciously adhered to the medium. In a carbohydrate medium, this organism is highly aciduric. For identification purposes, we have tentatively named this organism *S. odontolyticus-intermedius.*

March 15, a male rat (Cage 2), from here on designated as the vaccinated rat, was given a tremendous dose of *S. odontolyticus* subcutaneously. Similar injections were repeated March 16, 17, 18, 19, 20 and 21. March 18, a final culture of *S. odontolyticus* was fed to the mother rat and her three young (Cage 2.) March 19, the saliva of all the rats in this cage was plated; yet, March 20, *S. odontolyticus* could not be observed on any of the plates. The same was true March 23.

As a result of the subcutaneous injections, the vaccinated rat developed small abscesses. March 22, one of these abscesses was cautiously opened and plated on nutrient agar-blood-sucrose. The plate was incubated thirty hours, and, March 23, *S. odontolyticus* was recovered in almost pure culture. March 23, the foregoing culture medium with the intact organisms was fed to the rats in Cage 2.

March 24, *S. odontolyticus* was for the first time recovered before feeding from all rats in Cage 2 but the mother. The agglutinating power of the blood of the vaccinated rat was compared with that of a control and no appreciable difference was noted. From March 24 to April 1, there was a gradual diminution of *S. odontolyticus* in the saliva of the non-vaccinated young rats. April 1, a culture medium with a profuse growth of *S. odontolyticus* colonies that had been derived from the saliva of the vaccinated rat in which *S. odontolyticus* had become stabilized, was fed to the rats. The feeding of the organisms and culture medium was continued twice a week for one month.

During this time, dental caries was progressive and *S. odontolyticus* was regularly recovered before feeding from the saliva of the young rats (Fig. 4, A). However, we were never able to demonstrate that this organism occurred in the old mother rat before feeding. The flora of the old rat was almost identical with that of control rats. (Fig. 4, B.)

May 12, the young female in Cage 2 had a litter of five, three of which survived. These baby rats and their mother

Fig. 1.—Pure culture of S. odontolyticus (mucoid variant of S. salivarius) grown on nutrient blood-agar-sucrose.

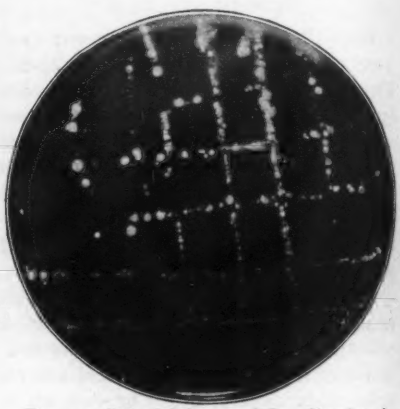

Fig. 2.—Colonial forms of S. salivarius derived from saliva of caries-immune individual. (Photograph taken with reflected light.)

were immediately placed in a separate cage (Cage 3).

At this time, it was noted that *S. odontolyticus* had disappeared from the the saliva of the non-vaccinated young male and the female (young mother now in Cage 3.) Later, it was evident that the decay process had been checked. However, colonies of *S. odontolyticus* have always been recovered in plentiful numbers from the saliva of the vaccinated rat and the decay process has been progressive.

September 15, it was observed that the decay process had again become active in the non-vaccinated rat and the young mother (now in Cage 3). Their saliva was plated and *S. odontolyticus* was again recovered. November 20, the teeth of three young rats comprising the original litter of Cage 2 were carefully examined. Decay had become very active. In all three rats, the lower second molars were badly involved and other teeth showed decay. In the case of the vaccinated rat, crowns of the lower second molars were completely destroyed and there was considerable caries involvement of the lower third molars and upper left first molar.

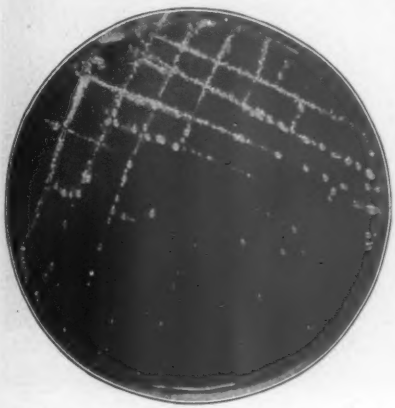

Fig. 3.—Colonial formation of S. odontolyticus derived from human saliva in case of caries hypersusceptibility.

Cage 3. May 12, the young mother and her litter of three male rats were moved to Cage 3 and placed on a diet consisting of skimmed milk, sugar and oatmeal. May 31, it was observed that a few transitional type colonies *(S. odontolyticus-intermedius)* could be derived from the saliva of all rats in this cage. At this time, nutrient blood-agar-sucrose covered with a growth of *S. odontolyticus* derived from the vaccinated rat was introduced into the diet. This dietary supplement was discontinued June 18.

November 20, it was observed that in two of the young rats *S. odontolyticus* had persisted and there was active dental caries present. Furthermore, these two rats had been affected with typical transitory phases of intestinal streptococcicosis. During an exacerbation, the stools were bright yellow and slimy and contained mucus. At this stage, the predominating bacterial growth from the stool (on nutrient blood-agar-sucrose) was a streptococcus that resembled *S. odontolyticus-intermedius.*

In the third young rat, *S. odontolyticus* did not become a constituent member of the oral flora and this rat gave no evidence of dental caries. Furthermore, this non-susceptible rat was only two-thirds as large as its susceptible brothers.

Cage 4. May 30, the old female that was originally in Cage 1 and was transferred to Cage 2 had a litter of two females. This mother and her young were placed in Cage 4, where they were fed a diet consisting of sugar, skimmed milk and oatmeal. June 24, the vaccinated male, with rampant caries, was placed in Cage 4 for breeding purposes and allowed to remain for several days. August 15, it was noted that the young rats in this cage had early evidence of tooth decay. The saliva was plated out and colonies of *S. odontolyticus* were found in significant numbers. The only contact these young rats had with *S. odontolyticus* was through the vaccinated rat. At this date, November 20, *S. odon-*

tolyticus persists as a constituent member of the oral flora of the young rats in Cage 4 and dental caries is active. The old mother, originally from Cage 1, gives no evidence of dental caries and *S. odontolyticus* has never been recovered from her saliva.

SUMMARY

The results of a controlled experiment have been set forth wherein: 1. Diets of oatmeal and skimmed milk; oatmeal, skimmed milk and sugar; oatmeal, skimmed milk, sugar and *S. odontolyticus* derived from a human being susceptible to dental caries failed to induce dental caries. 2. *S. odontolyticus* was stabilized to the environmental condition which obtains in the rat, by the subcutaneous injection of the viable organism into that animal. It was then successfully introduced into the oral flora of rats that were fed from infancy on skimmed milk, oatmeal and sugar, and active dental caries occurred.

CONCLUSIONS

The limited scope of this experiment does not justify conclusions. However, the opinion is hazarded that particle size could have nothing to do with dental caries observed in these rats, since the non-susceptible rats consumed the same cereal in even larger quantities. Furthermore, it is suggested that caries acuta is in all probability the result of a specific bacterial disease superimposed upon a state of malnutrition and associated with excessive sugar intake; that is, poor nutrition is not the cause of caries, but it renders the subject more susceptible.

ADDENDUM

In the interval since the present paper was submitted for publication, the following additional information has become available.

All of the experimental rats have died with the exception of the old mother rat originally in Cage 2. During this interval, one rat in the cages receiving no sugar has died. The latter rat was approximately 3 years old and had been used some months previously in testing for the toxicity of an autogenous vaccine.

The old mother rat referred to above has at this date developed rampant dental caries and both *Streptococcus*

Fig. 4.—A, growth obtained from whole saliva of rat afflicted with rampant dental caries. B, colonial formations derived from saliva of control rat. The medium was nutrient blood-agar plus 2 per cent sucrose.

odontolyticus and the intermediary type previously referred to have become established as stable members of the basal flora.

The necropsy findings will be the subject matter of another report.

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The authors wish to express their appreciation to the staff members of the Science Department, Upper Iowa University, who have followed this experiment, for their many suggestions and constant encouragement.

THE LIGHTING OF DENTAL OFFICES

PREPARED BY THE COMMITTEE ON LIGHTING PRACTICE OF THE ILLUMINATING ENGINEERING SOCIETY*

FOREWORD

THE Illuminating Engineering Society was organized in 1906 for the advancement of the theory and practice of illuminating engineering and the dissemination of knowledge relating thereto. The Society has now about 3300 members who are interested in the subject of lighting from various standpoints: engineering, economic, hygienic, esthetic.

In the preparation of this report, members of the Illuminating Engineering Society appointed to make the study were guided in their work by members of the dental profession.

INTRODUCTION

The seeing requirements for dentistry are more exacting than for most professions. It is probably for this reason that dentists have always been interested in lighting. In 1939, this interest became activated in widely separated parts of the country and was brought to the attention of the Illuminating Engineering Society. The following report on dental office lighting is submitted as a result of numerous fundamental studies of the many seeing problems involved in dentistry.

In considering dental office lighting, it should be recognized that in recent years there has been a rapid development of new and fundamental knowledge relating to artificial light and its application to various seeing tasks; that there has been a pronounced increase in the number of types of light sources available for producing adequate levels of comfortable lighting; and that the results of studies to determine what constitutes comfortable seeing conditions in schools and offices and for industrial processes apply also to related problems in dental office lighting.

SEEING AND LIGHTING

Studies of various occupational groups show greatest prevalence of defective vision in those groups where daily concentration on difficult seeing tasks is required. An analysis of over 100,000 eye records[1] of insured males shows that in groups of outdoor workers such as the farmer and the common laborer, the percentage having de-

*In collaboration with the following subcommittee from the Eighth District Dental Society of the State of New York: E. W. Fowler, Chairman; E. J. Doran, D.D.S.; E. H. Greppin; Leon J. Gauchat, D.D.S.; L. C. Hoews, D.D.S.; L. S. Ickis; H. J. Mayo; L. H. Meisburger, D.D.S.; J. F. Parsons; E. H. Robinson.

fective vision is 21 per cent at ages 20-24, to 78 per cent at ages 55 and over. In groups including machinists and printers, it was found that 29 per cent at ages 20-24 to 77.6 per cent at ages 55 and over had defective vision, while in those groups having the most difficult seeing conditions, as is the case with business men and professional men, the percentage is 36.4 per cent at ages 20-24, to 83.4 per cent at ages 55 and over. The dentist would be classified in the latter group.[2]

During his professional career, the dentist's eye undergoes a number of changes which affect the efficiency of seeing. The graph (Chart I) shows the degree of change between age 20 and age 50.

Much can be done to give assistance to defective eyes. Eye glasses correct refractive errors and assist the eyes in focusing on near and far objects.

While adequate illumination results in noticeable improvement in eye comfort, with less fatigue and less nervous tension to the normal eye, it aids to even greater extent the visually handicapped. Carefully conducted tests show that the seeing load imposed by present-day difficult eye tasks and prolonged hours of close visual application is lightened by increasing the illumination on the work.[3] The more exacting the eye task, the more illumination must be supplied for the same ease of seeing.

A study of dental operating technic brings out points of special interest. The eyes of the dentist are required to see fine

TABLE I.

	Minimum Footcandles to Be Maintained in Service
OPERATORY AND HYGIENIST	
General Lighting	50
Supplementary Lighting	
Studies of the amount of light required to see average tasks within the mouth[4] indicate that lighting of the order of from 150 to 1000 footcandles should be available in the operatory. (Chart II)[5] This range is necessary to meet the varied requirements of the location, reflection factor, and severity of the work, and the technique and visual efficiency of the individual dentist. It can best be provided by a supplementary lighting unit.	
LABORATORY	
General Lighting	25
Supplementary Lighting	
All over work bench	100
At one point	200
STERILIZING	25
X-RAY ROOMS	25
OFFICES[6]	
General Lighting	
Consulting Office	25
Clerical Office	50
RECEPTION ROOMS	
General Lighting	10
Supplementary Lighting	
(at all reading positions)	25
RECOVERY ROOMS	5
CORRIDORS	5
CLOSETS	5

detail over relatively long periods of time. Seeing in the mouth involves a brightness range from about 10 per cent reflection factor of the gums and tissues, to about 60 per cent reflection factor of the tooth enamel. This in itself may create some visual strain. Visual acuity must necessarily be high for the detection of minute cavities. The operator must be able to observe the cavity walls to be sure they are free of decay and he must easily discern proper retention angles.

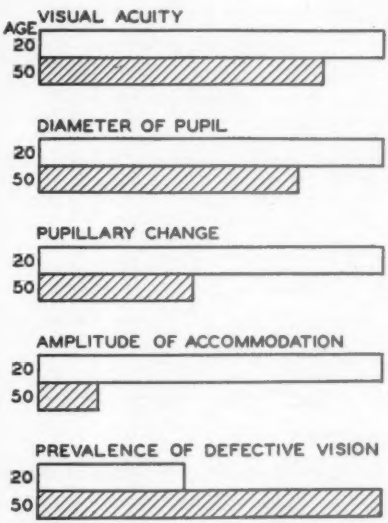
Most of the seeing is done within arm's reach, which requires the eyes to accommodate and converge. Nervous muscular tension develops as a result of "close work." This nervous fatigue causes psycho-physiological exhaustion in proportion to the degree of strain. The extent of fatigue, however, can be brought within safe limits by proper increase in the visibility of the objects seen.

Seeing is a relation involving three elements: the eye, the object and the light. For any specific art of seeing, the eye and the object must be regarded as fixed, and the light as the only variable which may be controlled.

The illumination values found in Table I are based on the characteristics of the visual task and the performance requirements.

ILLUMINATION VALUES FOR DENTAL OFFICE LIGHTING

The illumination values given in Table I should be *maintained in actual service on the work or in the space in which the given activity is carried on. Higher values will contribute greatly to accuracy, speed and care.* For artificial lighting, the permanent operating values are likely to be as much as 50 per cent lower than the initial value. The depreciation must be taken into consideration in the design of the installation.



From the "Science of Seeing" by Matthew Luckiesh and Frank K. Moss

Chart I.

During his professional career the dentist's eye undergoes different changes which affect the efficiency of seeing. The graph shows the degree of change between age 20 and age 50. Besides correction of refraction to compensate for these changes, the older the dentist the more he needs good lighting, and the more benefit he derives from it.

For any operation, the illumination should be measured on the plane occupied by the work or seeing task, whether it be horizontal, vertical, or at some intermediate angle. Readings should be made under working conditions, in so far as possible, with the operator in the act of doing specific tasks in order to present a picture of the true working condition.

BRIGHTNESS AND BRIGHTNESS CONTRASTS

While illumination recommendations are

made in terms of incident light, that is, in footcandles, our visual impressions result from brightnesses in the field of view.

To see an object it must have a brightness or color contrast with its background. Many dental defects are difficult to discern because of the slight brightness or color difference between the defect and the rest of the tooth. It is an established fundamental of vision that, as the brightness of an object is increased, the eye sensitivity is increased so that these slight differences in contrast become easier to discern. Certainty of seeing is essential in dental work and ease of seeing is equally important. Both are obtained by combining higher illumination with avoidance of glare and dark surroundings.

It is important to diffuse the lighting and shield it or in other ways eliminate glare from the light sources in the field of view. If this is not done, brightness contrasts between the work and its surroundings are too high. The resulting condition is referred to as glaring by the illumination engineer. The layman is likely to refer to the condition as "too much light." In the great majority of cases, the answer is "brightness or darkness out of place." Where a window provides natural daylight, glare from adjoining buildings on sunny days may also require control. Where illumination in the working area is increased ten times, the brightness of the light sources may be increased not more than two times for equal comfort.

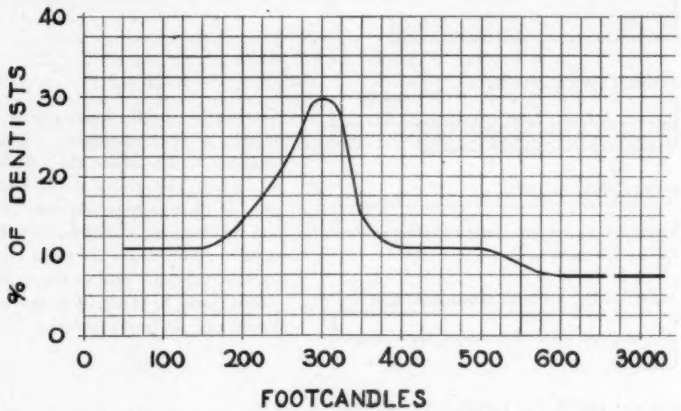


Chart II.—A study of illumination values required by representative group of dentists for tasks of average severity.

BRIGHTNESS

Direct glare from light sources, such as an overly bright lighting unit, ceiling or window in the field of view, will contribute materially to the visual discomfort of the observer and may reduce the visibility of fine detail. Glare from lighting equipment often can be overcome by proper design, or by locating the unit out of the field of view. Many times the proportions of a room are such as to fix the position of the luminaires so that recourse cannot be had to their removal from the normal visual range; therefore, close attention must be paid to controlling the light emitted in the direction of the eye.

Reflected glare, as its name implies, is caused by the reflection of high-brightness sources by ceilings, walls, desk tops, tabletops, furniture, or other surfaces within the visual field, such as materials and machines. These brightnesses are accentuated when the surfaces are glossy or specular in character, such as highly polished machine parts, smooth-finished surfaces, varnished or enameled table tops, or other highly reflective surfaces. Reflected glare is frequently more objectionable than direct glare because it is so close to the line of vision that the eye cannot avoid it. One of the potential sources of annoying reflected glare is polished metal surfaces on instruments. The development

in recent years of satin-finished instruments for dentists and surgeons and of dull-finished typewriters for stenographers, and the gradual elimination of glossy and glass desk tops, has not come about by chance but has been the result of constructive criticism by illuminating engineers who meet these problems every day in the field.

Shiny or glossy finishes should be avoided. Mat finishes diffuse spots of light, reduce brightness contrast, and appear more evenly illuminated. Also mat surfaces will not collect dirt any more quickly than glossy finishes. Therefore, flat or mat-finished paint or dull-surfaced materials should be used on all wall and ceiling areas, including the window, door frames and trim, and dental machinery.

Fig. 1.—Operatory. The even distribution of brightness in the area is apparent. The intensity of local light furnished by the spot is varied by changing the distance between it and the head of the patient. The conspicuousness of the dark floor mat makes it obvious that the contrast may become annoying. Note absence of shadows in the entire area.

BRIGHTNESS DISTRIBUTION

In designing a general lighting system, it is desirable to produce an illumination which is as uniform as is practicable. In recent years, extensive tests have indicated that certain ratios of brightness must not be exceeded for comfort or seeing efficiency. Thus, in order to avoid too high brightness contrast of surroundings, the ceiling should have a reflection factor of not less than 75 per cent, the side walls 60 per cent, and the floor 35 per cent. The use of dark foot-mats should be avoided. These values in combination with proper light sources will provide reasonable brightness distribution.

The color scheme used in painting the dental suite is of importance in providing good seeing conditions and creating a pleasant, restful atmosphere. Many colors commonly used in decorative work vary in appearance under the illumination from different light sources. To insure satisfactory combinations, it would be desirable to select color schemes under the particular illumination employed in the area. If neutral and near neutral tones are selected, the aspect of the room may be brightened by the use of touches of color in the trim and draperies.

Achieving proper brightness balance re-

quires, besides the above, a consideration of the light reflection characteristics of towels, bibs and gowns. Studies for surgery in hospitals[7] indicate that these values should not exceed 40 to 50 per cent.

Since the operator's eyes are being constantly shifted between the mouth and the bracket table during an operation, the brightness of this work surface and its background is important. In general, the seeing involved requires close discrimination of small articles which are to be transferred to the mouth. The table should have a mat finish. If not, it should be so located that it will not reflect the light source brightnesses to the eye. As a rule, the general room lighting will serve to light the bracket table.

The cabinet is also a focal point in the operatory. While the proper general lighting may provide sufficient illumination for this area, supplementary lighting often is required. Since it too must not present a highly contrasting brightness, the table area of the cabinet should have a reflection factor of 40 per cent or more.

The color quality of the light is an important consideration, particularly in the operatory and laboratory where accurate color matching or color discrimination is required. For most color-matching work, tungsten-filament lamp units equipped with suitable blue-glass filters have been most generally used. The ordinary "daylight" blue tungsten-filament lamp is not a true daylight and should not be relied upon for this work. The daylight fluorescent lamp, however, closely approximates average daylight color and has proved quite satisfactory for color matching in most cases. Color matching usually can best be performed under relatively high levels of illumination (100 foot-candles or more).

It should be kept in mind that there are some materials which will match under one

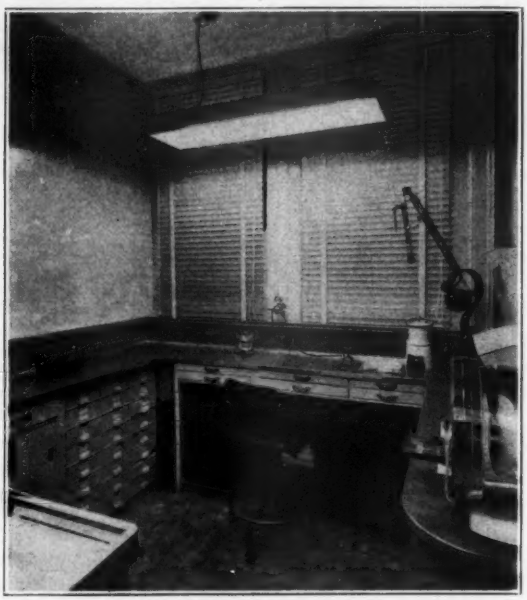


Fig. 2.—Laboratory. Industrial direct type luminaries are used in this work area. Local lighting units for high-lighting small detail and under work cabinets are not shown in the illustration. Note that the venetian blinds have approximately the same reflection factor as the side walls, which are only 3 to 4 times as bright as the counter top and about twice as bright as the floor. The balance of brightness in the field of view helps to add comfort to the working conditions.

color quality of light, but which will appear different under another quality of light. Such variations can usually be detected by comparing the materials under two different color qualities of light. This can be accomplished by inspecting the materials under a source of daylight quality light and with the unmodified light from a standard tungsten-filament lamp.

TYPES OF LIGHTING—NATURAL LIGHTING

By far, the majority of dental work is done during the daylight hours, and for many years the dentists have depended upon natural lighting almost entirely. Until recently, satisfactory artificial illumination has not been available for the dentist.

For this reason, it has become the practice of dentists to position the dental chair immediately in front of the window with the patient facing the window, and in such a position that the patient's head is 4 or 5 feet removed from the window, and 3 to 4 feet above the floor, as an average.

Preference is shown for offices with a northern exposure as it is felt that this provides the most constant quality of natural illumination and relatively less exposure of the patients to the direct sunlight at any time of day. Louvers or venetian blinds, if properly finished and adjusted, are an effective means to control the distribution of natural illumination as well as the glare from windows.

In an interior that is well illuminated with natural light, brightness measurements have indicated that the operatory itself, the bracket table, and the instrument cabinet shelf may be reasonably well illuminated, but brightness measurements inside the mouth indicate inadequate illumination.

Fig. 3.—Laboratory. Bench lighting is provided by fluorescent lamps mounted directly to the lower supply shelf. A supplementary spotlight is available for work of extreme detail. General diffuse lighting illuminates all shelves effectively.

LUMINAIRE REQUIREMENTS

The problem of fitting illumination to the requirements of precision dentistry is complicated and difficult because of the conditions under which the dentist must work, the position of the patient in the chair, the necessity for getting light into the oral cavity from the right direction, as well as in the proper

quantity, and, finally, the fact that although the dentist is interested in a very small visual field in which he is working, it is impossible to exclude the much larger visual field in which he is not interested. This peripheral or background field should not contain light sources or surfaces which produce glare and should not be so dark as to present objectionable contrasts.

Artificial lighting should be so designed as to provide good illumination to meet both day and night conditions. Wiring and switches should be so arranged that the system can be properly and economically controlled for daytime operation. The manner in which the light from the source is controlled governs, to a large extent, the important effects of glare, shadows, distribution and diffusion. The selection of the best type of lighting system for a particular area is, therefore, a most important decision.

OPERATORY

In the operatory, the visual task is most severe and extra care must be taken to provide adequate illumination and a "balance" of brightness.

GENERAL LIGHTING

Information required to produce the minimum sustained value of 50 footcandles (Table I) from various light sources may be determined from standard illuminating engineering practice. However, in order to provide proper distribution of brightness, it will be necessary to select a luminaire which will insure suitable brightness on the ceiling and side walls. If luminaires for incandescent lamps are chosen, they should be of the indirect or luminous indirect type where all or nearly all of the light is directed upward. If a fluorescent luminaire is selected as the source, a general diffuse type is preferable. This latter type produces as much light upward as downward. In all cases, the lamps should be shielded in the zone from the horizontal plane of the luminaire to forty-five degrees below the horizontal. This may be

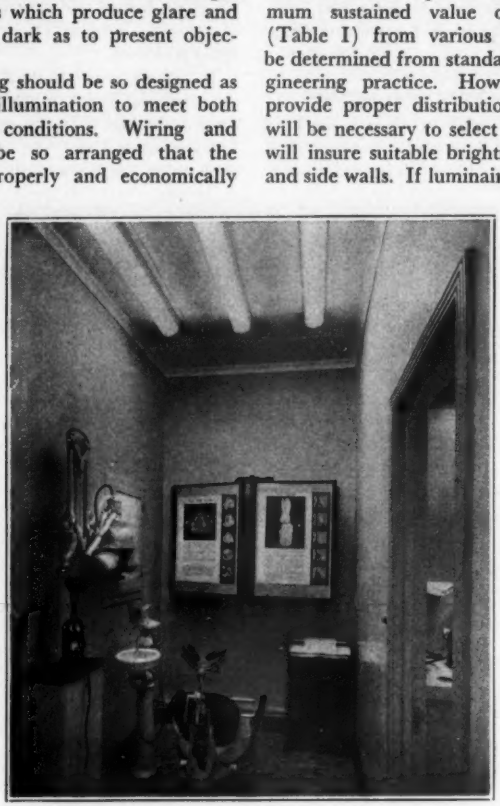


Fig. 4.—X-ray room. In this instance, a separate area is utilized for x-ray work. Shadows are minimized and glare reduced by shielding the light sources and applying light colors to ceilings and side walls.

accomplished by means of either so-called egg-crate louvers or translucent panels. On ceilings lower than nine feet, shielded units may be mounted on the surface of the ceiling, but in no case should these be less than seven feet from the floor. Inasmuch as the operating chair is the chief interest, the primary source of general lighting should be located over this area. If a fluorescent luminaire is used, it should be mounted lengthwise of the chair with the center of its crosswise axis slightly ahead of the headrest when the latter is in its most erect position (Fig. 1). Where the operatory is larger than 100 square feet in area, additional units will be required.

Fig. 5.—Consulting office. The doctor's private office is comfortably lighted in accordance with standard office lighting practice.

SUPPLEMENTARY LIGHTING FOR THE ORAL CAVITY

Investigators have made a serious attempt to avoid the use of a supplementary light to provide the required illumination in the oral cavity. Apparently it is not economically feasible to make this elimination (Chart II). The supplementary unit, preferably, should be located so that it is directed toward the oral cavity, to the rear of and to the right or left of the operator's head. The use of a head-reflector or head-lamp is not recommended for general practice. The reflector requires a bright sharp source in front of the operator, which will probably produce discomfort and disability glare, and, with the head-lamp, there is possibility of electrical shock from frayed or broken cords.

The patient's position is arranged by the dentist to provide maximum ease of work for various operations and is somewhat dependent upon operating technic. At times the patient is facing the ceiling and at other times, directly forward. This means that the scope of the operating light must cover a wide variation of positions.

Besides meeting the requirements of flexibility in multiplicity of positions, the supplementary lighting system should be selected for its ability to provide illumination well within the oral cavity regardless of the position of the dentist's hands and body. Changes in the quantity of light provided for

various tasks should not be accompanied by a change in color quality.

HYGIENIST'S ROOM

The visual task in the hygienist's room is not as severe as in the operatory. Research, however, indicates the desirability of following the same lighting technic in order that apparent dental defects may easily be noted.

LABORATORIES

Prosthetic work in the laboratory requires speed, accuracy, and close inspection. Well-controlled lighting in the order of intensities prescribed in Table I is, therefore, essential (Figs. 2 and 3).

Physical dimensions in these areas differ so greatly in all dental suites that it is difficult to write a specific prescription. Generally, all sources of light should be shielded from direct view. Standard industrial types of direct lighting units may be used mounted at or near the ceiling and so located in respect to the working surfaces that these areas are free from disturbing shadows when the operator is in his normal working position. Local lights consisting of spotlights known as reflector or projector lamps may be mounted on the ceiling to the left or right, and slightly back of the working position and focused on the working surface. Louvers may be placed over these units to eliminate stray light which may cause glare. Where cabinets are mounted over work benches, tubular lamps may be placed along the front edge of the cabinets and shielded by a valance.

Special mention should here be made of reflection factors in this area. Vertical surfaces such as side walls, cabinets, etc., should be approximately 40 per cent reflection; white ceilings at least 75 per cent, and horizontal work surfaces at least 25 per cent reflection. The only exception may be a small movable area such as a piece of black linoleum which may be used for silhouette seeing.

For color work, it is recommended that two color qualities of illumination be provided. Thus, if the laboratory is lighted with tungsten-filament lamps, an artificial source of daylight should be provided for color matching. On the other hand, if the laboratory is lighted with daylight fluorescent

Fig. 6.—Waiting room. Each reading position has ample illumination from floor lamps. The necessity for a sufficient number of baseboard outlets is evident.

lamps, for instance, a color matching unit utilizing tungsten-filament sources should be available. Selection of porcelain teeth under the two qualities of light also has a very practical advantage; that is, a match under the two qualities will assure that the teeth will appear satisfactory outdoors and indoors. Best color matching is accomplished when the surfaces being inspected do not reflect the image of the light source.

In many cases, a high-brightness light source is desirable for the examination of artificial dentures. Where the dental unit does not provide this high brightness, a small supplementary unit such as a shaded 60-watt tungsten-filament lamp or a 40-watt reflector showcase lamp should be provided at the wall or table in the laboratory so that the dentist may obtain the higher values of specular light by holding his work close under the lamp.

STERILIZING ROOM

The lighting should be well diffused in order to minimize shadows and brighten the area. The practice of making this room a very distinctive part of the dental suite so that the patient's attention is directed toward it appears to be growing in popularity. Often a viewing window is placed so that the patient may examine the area from outside the room and be impressed with the care taken for prevention of infection. In this case, attention may be called to the area by providing a contrast of color in the lighting or decorating scheme. For example, if fluorescent lamps are used in the corridor or adjoining room, then incandescent lamps may be used in the sterilizing room, and vice versa.

X-RAY ROOM

On occasion, an area other than the operating room is set aside as an x-ray room (Fig. 4). Here the visual task is not severe and lighting comfort should be the chief consideration. Fixtures of low brightness providing well-distributed illumination should be used.

An essential part of the equipment is the transilluminated screen for viewing negatives. The cavity in back of the screen is so designed and lighted that the brightness of the screen is relatively uniform all over. As a rule the screen is located where the operator may study the negatives at his ease, such as on a shelf on top of the cabinet. In some cases, a supplementary viewing screen is located adjacent to the dental chair so that the operator can readily refer to the x-ray film while exploring for defects in the patient's mouth.

OFFICES (CLERICAL AND CONSULTING)

In the clerical and consulting rooms, it is essential that footcandle levels do not fall below the value given in Table I. In the office where clerical work is done (Fig. 5), it is desirable to provide an illumination of 50 footcandles of general lighting. Special care should be taken in the selection of suitable luminaires. When tungsten-filament lamps are used, luminaires of the indirect or luminous-indirect type should be installed. In the case of fluorescent lighting, lamps should always be shielded with a suitable diffusing material so that both reflected and direct glare will be eliminated and shadows reduced to a minimum.

Local desk lamps are *not* recommended. They occupy useful desk space and are apt to produce discomfort glare and veiling sheen on desk work. They may also concentrate too much light in too small an area so that the contrast between the local light and surrounding illumination produces discomfort.

Office machinery should be finished in mat surfaces where available. Desk tops should have no glossy surfaces and should be light in color with a reflection factor of not less than 25 per cent.

RECEPTION ROOM

The lighting of the reception room (Fig. 6) should follow general home lighting practice. Thus, floor and table lamps, meeting the specifications of the Illuminating Engineering Society, should be located at each possible reading position. Naturally, a judicious arrangement of furniture in relation to the lamps will often make it possible for one lamp to serve more than one reading position.

Since it may be desirable to rearrange the furniture from time to time, care should be exercised to assure that there are a sufficient number of convenience outlets properly located to service the reading lamps wherever they are located. Convenience outlets

should be on not more than six to twelve-foot centers and there should be at least one for every wall space which could possibly accommodate a chair, stand, clock, floor fan, lamp or decorative device.

While some general lighting is recommended for the reception room, its principal purpose is to assure a bright cheerful atmosphere free from harsh brightness contrasts. The general lighting is also valuable as an aid to the meticulous cleanliness which is expected in any area connected with the surgical profession. The general lighting should be low in brightnesses in the direct glare zone. Some form of indirect lighting appears to be particularly suitable.

RECOVERY ROOM

The lighting of the recovery room should follow the same general pattern as for the reception room. In this case, the general lighting provided would definitely be for clean-up purposes and probably would not be used while the room was occupied. Floor or table lamps, properly shielded from direct view, are quite suitable for providing the room illumination when the room is occupied inasmuch as it may be expected that the occupant will not be engaged in doing any particular visual task.

If fluorescent lamps are used to light the recovery room, the soft white lamps are recommended since the color of the light emitted by this lamp has the most flattering effect upon the color of the patient. In this connection, it is also worth while to make sure that mirrors used in this room are made from water-white glass rather than from glass which gives a greenish tinge to the reflection.

CORRIDORS AND CLOSETS

Any passageways not separated from the working space by high partitions should have the same general illumination as the rest of the office space. In corridors and passageways having high partitions, lower levels of illumination may be used. If the partitions are of glass so that the lighting equipment is visible from the rest of the office or suite, the same restriction with respect to brightness of the lighting sources should be observed as in the adjacent areas.

Corridors and passageways shut off from the rest of the office space should have light colored ceilings and upper side walls in order that the light may be effectively utilized and the space be given a pleasing appearance. The spacing of lighting units should not exceed one and one-half times the ceiling height and an average illumination of not less than five footcandles should be maintained. A higher illumination is desirable if the adjacent areas are very well lighted.

The location of stored materials and personal belongings is expedited by the installation of five footcandles or more in closets. A great convenience in connection with closet lighting is an automatic switch which works with the opening and closing of the closet door.

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GINGIVITIS: ITS CAUSES AND TREATMENT

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IN treating any disease of a limited area of the body, it is essential to regard that disease in terms of the body as a whole. This axiom holds as true for the dental physician as for the medical physician. Thus, in studying causes of gingivitis, it is necessary to search for the systemic as well as for the local causes.

Gingivitis is an inflammation of the soft tissues normally surrounding the teeth. The gingival tissue is so sensitive an indicator that it frequently, through inflammation, will warn of serious impending disorders in the body whole. That gingivitis is always a precursor of periodontoclasia, or "pyorrhea," is erroneous.

Gingivitis may be the initial step in periodontoclasia, but that disease is not necessarily preceded by gingivitis. Gingivitis, as frequently, is a disease entity in itself, induced by lowered systemic resistance. It should, therefore, be obvious that since gingivitis is by no means always the forerunner of periodontoclasia, great care should be taken in the prognosis of the disease. Many teeth that need never have been lost at all have been sacrificed to that terrifying myth, "Four out of five have it," because some one, thinking that gingivitis inevitably became periodontoclasia, decided to extract all the teeth at that stage rather than use palliative treatment.

Another conception which is entirely erroneous and therefore dangerous may be mentioned in this regard; that is, that if periodontoclasia is general and the teeth are allowed to remain as long as they can function, the alveolar ridge, when they finally are lost, will be unfit to comfortably support dentures. This theory has given solace to many a conscience uneasy because of the extraction of teeth in a youthful patient. The conscience should still be uneasy.

If gingivitis is due to controllable conditions and these are correctly diagnosed, periodontoclasia will not result. If periodontoclasia has already occurred from conditions that are controllable, it can be checked so effectively as to cause no apprehension about the future of the case. This, fortunately, is true of 96 per cent of cases that have progressed even to the deep pocket stage. Of the remaining 4 per cent, the causes of the disease are obscure and probably of systemic origin. Therefore, removing the teeth early will in no wise stop the alveolar resorption or provide a better alveolar ridge. Contrariwise, under the pressure of the artificial dentures, physiologic atrophy of the ridge will occur very rapidly, so that these patients can rarely be made comfortable.

The local causes of gingivitis are well known. It is not necessary to dwell here on the mechanical irritation caused by poorly fitting dentures or food impaction due to faulty contact points. Nevertheless, these faults still exist and should not be minimized.

Calculus plays a very important part in chronic inflammation of the gingival tissue. It is undoubtedly the chief local cause. Calculus is usually considered as of two types: the supragingival, or salivary, and the subgingival, or serumal. It was at one time thought that salivary calculus originated in the saliva and ser-

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umal in the blood. However, Kronfeld[1] has pointed out that the source of both types is the saliva. He states that the bottom of the gingival crevice is the limit of deposition of any kind.

Salivary calculus is white or yellowish unless darkened by excessive smoking. It occurs most frequently in the region of the orifices of the salivary glands; that is, on the lingual surfaces of the lower anterior teeth and the buccal surfaces of the upper molars.

Subgingival calculus may be found in any protected area of the mouth. It is dark green or brown and is brittle and hard. It is more dense than salivary calculus. Its color is due to pigmentation from minute hemorrhages of the soft tissues, the result of irritation by the calculus. To detect serumal calculus, it is necessary to use an explorer. Even this must be used with very sensitive fingers because the deposits are so fine and shale-like as often to elude detection.

The mechanism of the deposit of calculus is not very well understood. Box[2] in his "Twelve Periodontal Studies" has given the following three conditions as essential to the deposition of calculus:

1. Calcium salts are present in a solution of colloids. Colloidal solutions hold in solution greater quantities of crystalloids than simple solutions for the reason that at the surface of each colloidal particle there is a zone in which the crystalloids are more concentrated than elsewhere, thus permitting more crystalloids to be dissolved in the solvent between the colloidal particles. On the other hand, the concentration of the crystalloids on the surface of the colloidal particles caused the colloids to serve as a starting point of precipitation whenever the crystalloids are in excess.

2. Adherent vegetations of Leptothrix micro-organisms on the tooth surface. These serve in some manner to fix the precipitates. The great surface development of these bacteria would seem to provide an ideal building medium.

3. A rise in pH of the pocket solution. This may be achieved, apart from CO_2 loss, through the growth and activity of a small micro-organism known as *Micrococcus gazogenes-albalescens anaerobius. Micrococcus gazogenes* is a strict anerobe, gram negative, and one of the smallest organisms known. It is probably present in all mouths. It does not ferment any of the carbohydrates or similar compounds, forms no acid and, in all media, with or without sugar, progressively produces alkali. There is a possibility, therefore, that it may take part in the precipitation of the calcium salts from the gingival crevice fluid.

The carbon-dioxide tension of the saliva also apparently influences the rate of precipitation of the calcium salts. Bibby,[3] in his experiments, proved that the greater the amount of carbon dioxide in the saliva, the greater the amount of calcium salts held in solution. As the carbon dioxide escapes, the calcium salts are precipitated. The calculus thus precipitated adheres to an area where bacteria and desquamated epithelial cells have accumulated to form a foundation for the concretion.

Saliva as secreted is faintly acid in reaction. When carbon dioxide is given off, the saliva becomes alkaline. This alkalinity seems very important in the formation of calculus.

It has been noted that diabetic children who have been observed over a considerable period have no caries, but do have a very noticeable deposit of supragingival calculus. Wright[4] explains that, in diabetes mellitus, there is an acidemia due to an accumulation of abnormal acids in the blood. These acids are neutralized by the blood plasma; acid phosphates are excreted, and the blood becomes more alkaline.

Broderick[5] states that the action of insulin in diabetics causes alkalinity of the saliva, and he believes that it is the action of the drug which accounts for the heavy calculus deposits rather than the disease itself.

Since calculus cannot be deposited upon the teeth in the absence of bacteria, it is essential to keep the bacterial count

within the mouth low. This cannot be accomplished successfully with antiseptic mouthwashes because they are not sufficiciently penetrating. Only careful and painstaking cleansing with toothbrush and rubber stimulator can reduce the flora which foster bacterial growth.

The stimulator is a device consisting of the usual handle associated with a toothbrush, but, instead of the brush, at a right angle to the end is a small conical rubber tip. This tip is inserted in the interdental space, and a firm pressure and release movement massages the gingival tissue, performing the dual function of cleansing the interdental spaces where anaerobic bacteria are most likely to lodge and of stimulating the circulation of the interdental papillae.

Use of the stimulator regularly is indicated for local treatment while other causes of the gingivitis are being investigated. It is also particularly useful where partial dentures have impinged upon the tissue to the point of causing localized edema and swelling.

An excess of calculus is always noted in the mouths of smokers. Broderick[5] points out that most researchers are of the opinion that the sulfocyanate content of the saliva is increased by smoking. He believes that this affects the blood pressure and that the action of nicotine is also to increase the secretory action of the stomach; which may result in hyperchlorhydria. The excess of hydrochloric acid robs the blood of the hydrogen and chlorine ions of the hydrogen dioxide and sodium chloride, the complementary sodium hydroxide ions remaining in the blood. These ions combine with the free carbon dioxide to make sodium bicarbonate. Thus may be explained the alkalemia that promotes the deposition of calculus.

It is a common error of physicians and dentists to call any lesion of the gingivae, not immediately obvious, a Vincent's infection. The classic picture of Vincent's infection is too well known to need description here. Yet herpes must be differentiated from a beginning Vincent's infection. Herpetic lesions are small discrete vesicles that break down and become infected by the usual oral organisms. They are not restricted to the gingival area, but may be distributed over the entire buccal cavity. After the vesicles erupt and break down, the lesions frequently coalesce. The underlying whitish gray membrane cannot be wiped off easily as in Vincent's infection. This form of herpes may be caused by a virus[14] and as such can be successfully treated by vaccines.

Herpetic lesions may also be induced by allergy. When lesions are distinctly localized and tend to recur in the same area, detailed studies should be made from the viewpoint of allergy. Often, simple occupational allergies such as those occurring in workers who place nails or other objects in their mouths can be detected by the dentist. More obscure allergies can be determined by the dentist and referred to the proper authority.

From the systemic viewpoint, an unbalanced diet is probably the most frequent cause of gingivitis.

Anton J. Carlson,[6] professor emeritus of the University of Chicago and one of the foremost physiologists of the world, made the statement recently that 95,000,000 Americans either cannot get the right food or have such bad habits that they do not eat enough of the right food. Since persons who seek dental attention are not usually among those who cannot get the right food, it follows that they must be of the group whose food habits are so bad that they do not *eat* the right food.

Hazel K. Stiebeling,[6] of the U. S. Department of Agriculture, points out in the "Annual Review of Physiology" for 1940 that one of the crying needs of today is the development of methods through which we may recognize the possible if not probable injuries arising from faulty diets before the well-known

and now recognizable deficiency diseases are upon us.

This statement places part of the responsibility directly upon the dentist. Since so many patients not consciously ill come under his observation, it is often he who can first observe the signs of nutritional inadequacy. This is often indicated by fragile, easily bleeding gingivae.

Normally, the gingival epithelium is covered with a horny layer. Orban[7] has shown that although the mucosa of the cheeks and vestibule do not normally become hornified, the mucous membrane surrounding the teeth and forming the gingivae and the interdental papillae normally does have a keratinized surface. Hornification of the gingival mucosa is an important factor in the maintenance of healthy normal gingivae. In its absence, the gingivae are abnormal, red and swollen, and bleed easily at the slightest mechanical injury. One of the underlying causes of this lack of hornification is an imbalance in nutrition.

The great American habit of lunching on a sandwich and a "coke" or a sandwich and a glass of milk is responsible for much of the nutritional inadequacy seen in persons who can well afford ample variety. Particularly are young persons prone to this diet. Much of the gingivitis and also the so-called chronic Vincent's infection can be traced to the prevalence of this diet among young adults.

The young American grows up with the idea of doing things quickly. Even in grade school, his luncheon time is cut, so that often he has but forty minutes for lunch, and part of this time is spent in going and coming. He is taught that unpunctuality is a worse sin than hunger. Hence, he learns to bolt any food as quickly as possible, and we have the curious anomaly of 95,000,000 people inadequately nourished in a land that has more food than any other country in the world.

This situation can be corrected only through education. It exists now because of indolence on the part of all those persons who should be actively correcting it. The dentist thinks that it is the duty of the physician, and the physician feels that he should interfere only when the patient is ill, and he is not apt to see the patient when he is well. They both leave it to the educator, who ignores it, except for a very brief chapter in the hygiene books. The trained nutritionist, in most instances, has no means of contact with the person who needs her services most.

The young American is imbued with the idea that cultivation of the sense of taste is somehow gross and greedy. He associates vitamins with medicine. However, because of insistent radio and press advertising, he realizes that vitamins are an essential. They offer no pleasure to any of his senses and he regards them rather as a medicine. If he could be taught from an early age that a variety of food offered a keen pleasure to his palate as well as his intellect and that sufficient time should be taken to enjoy them, he would be taking a long step away from the diseases caused by nutritional disturbances. The schools cultivate the appreciation of beauty as expressed in artistic forms and color. It is as important to cultivate beauty as expressed to the palate by way of variety in food as it is to cultivate it as expressed on the palette by way of the paint brush.

The dentist can by no means shirk his part in this educational program. When he has a case of gingivitis which persists after all calculus has been removed or in which calculus reappears very quickly after removal, it is not enough to say vaguely, "You need more vitamins" or "You'd better get some ABD capsules and take a pint of orange juice a day." Even if this shotgun dosage worked, the patient would be apt to pursue it only while the first dose lasted or possibly for a month or two, when he would lapse into his former habits. No,

the essential point is to change his habits. To accomplish this, the dentist must inquire carefully into the food habits of the patient. He must have him keep an accurate and careful record of his food intake for a given period. The dentist himself must be able to evaluate this record and to give specific directions as to a balanced and varied food intake.

According to Wright,[4]

An adequate diet must have a caloric value sufficient to provide for the requirements of the basal metabolism, the stimulating action of the foodstuffs, loss of energy in excreta, and the needs of muscular work. It must have adequate amounts of protein, fat, carbohydrate, water and salts in suitable proportions, and an ample vitamin content.

The average caloric requirement of a man doing light work is 3,300. This nets about 3,000 calories after ingestion. The average housewife requires about 10 per cent less, but a woman doing heavy work requires as many calories as a man. Children over 12 years require the same amount of food as an adult. However, all classes of brain work must be classed as sedentary. The most intense mental activity causes no appreciable increase in metabolism.

The constitution of an average normal diet is usually given as follows; protein, 100 gm. (410 calories); fat, 100 gm. (930 calories); carbohydrate 400 gm. (1640 calories) = 2,980 calories (total); about 3,000.

The accompanying outline is one which we use in general for the average patient whose gingivae show a lack of adequate nourishment. Careful observance of the simple rules outlined here result in truly dramatic improvement.

DIET LIST

Daily one-half pint of orange, tomato or grapefruit juice.

Twice a day, protein in the form of meat, eggs, fish or cheese. It is desirable to have four or five eggs a week.

Twice daily, one portion of the following vegetables:

lettuce	swiss chard
spinach	endive
cabbage	brussels sprouts
watercress	turnip greens
cauliflower	broccoli
kale	beet greens

Once daily, one or more of the following vegetables:

carrots	cucumber
beets	squash
peas	parsnips
corn	turnips
string beans	rutabaga
pumpkin	artichokes
onions	asparagus

Carbohydrate to fill the balance of the diet: bread, potato, noodles, macaroni, cereals, one at each meal, with fortified bread or whole grain cereal at two of these meals.

In addition, 1 pint of milk every day. It may be in the form of cottage cheese, cream soups, creamed vegetables or custard.

15 drops of cod liver oil daily.

Any amount of fruit.

The slogan "Reach for a cigarette instead of a sweet" has also done much to impair the health of the gingivae. By deliberately endeavoring to thwart the normal appetite for food, persons have forced themselves to subsist on an inadequate, if not, in many instances, a starvation diet. The acceleration of calcareous deposits by smokers has been pointed out in a previous paragraph.

There is a close relationship between diet and the endocrine glands.

In those cases in which there seems to be an excessive amount of débris at the gingival margin resulting in cervical caries, it will be found that, nearly always, the subject has a lowered basal metabolic rate. This results in an apparent anoxemia of the gingival margins, which permits the excessive development and growth of bacteria. Excessive ingestion of carbohydrate will also have this result. The ingestion of food normally increases the metabolism, but does so least with carbohydrates and fats, most with proteins.

Inflammation and proliferation of gingival tissue may be due to endocrine disturbances. This proliferation may become hyperplastic. At first, according

to Kronfeld,[1] there is usually a true inflammatory swelling of the gingivae. In this stage, the tissue appears microscopically as granulation tissue containing varying amounts of polymorphonuclear leukocytes. If hyperplastic gingivitis persists, fibrosis of the tissues usually takes place. The fibroblasts multiply rapidly, connective tissue is formed, the inflammatory cells disappear and finally the tissue microscopically resembles a fibroma.

Any stage of this picture may be initiated by a disturbance in the secretion of the sex hormones. One group of female sex hormones is estrogen. Estrogen, according to Wright,[4] can be extracted from the whole ovary; liquor folliculi, the ovarian residue after the liquor has been aspirated; in certain stages of development, the corpus luteum placenta and fetal membranes, and liquor amnii, and, in large amounts, from the urine of pregnant women and mares. It is present in small amounts in the urine of normal women and the urine of men.

Estrogen in the female governs the growth and development of the genital tract and the secondary sex characteristics. It is probably first secreted at puberty, when its appearance is initiated by the action of a hormone from the anterior body of the pituitary gland. Its action may be demonstrated in ovariectomized women undergoing estrogen treatment. In these patients, the uterine muscle grows and the atrophied endometrium develops under therapy until it attains a state indistinguishable from the proliferative phase of the normal menstrual cycle. There is also some increase in the size and vascularity of the cervix.

The secretory activity of the cells lining the fallopian tubes is stimulated by estrogen and the motility of its muscle coat and of the cilia is increased. Stratification of the vaginal epithelium is promoted. The action of estrogen also produces various degrees of proliferation of the ducts of the breasts and induces growth of the epithelium of the nipple in both sexes.

The anterior pituitary body secrets two hormones that control the activity of the gonads. They are, in the female, the follicle-stimulating hormone, or prolan A, and the luteinizing hormone, or prolan B. These gonadotropic hormones control the ovarian cycle and the liberation of the two ovarian hormones, estradiol and progesterone. Estradiol (or estrogen), or dihydrotheelin, is the hormone actually produced by the ovary. Progesterone, or progestin, is the hormone produced by the corpus luteum.

The anterior pituitary plays an important part in the regulation of the other endocrine glands. The part the other glands play is less well known. There is evidence that prolonged administration of either estrogens or androgens (the male sex hormones) may cause marked changes, both structurally and functionally, in the anterior pituitary gland. The prolonged administration of these hormones may inhibit the secretion of gonadotropic hormones by the gland, thus leading to atrophic changes in the ovaries and testes. "It is suggested that the concentration of estrogen or androgen normally present in the blood may regulate the rate of formation of gonadotropic hormones, thus leading to proper functional coordination between the pituitary and the gonads."[4]

Chemically, the estrogens belong to the general group of sterols. In this group containing the characteristic ring system are: the estrogen group; the corpus luteum group (progesterone); the male sex hormones; the adrenal cortex hormone; cholesterol and related compounds such as coprosterol, ergosterol, stigmasterol and the bile acids. The cardiac glucosides of the digitalis group contain sterols such as digitoxigenin. One of the vitamin D group is closely related to ergosterol.

With this close chemical relationship between the estrogens and vitamin D,

that food plays an essential part in the normal metabolic function of the body is evident. The dietary factors may conceivably influence the endocrine functions by deficiency or excess of the supply of substances necessary for (1) the synthesis of the hormones, (2) the action of the hormones in the body and (3) the inactivation of hormones.

Thus, it is seen that, with the close relationship between the endocrines and diet, difficulty might be encountered in evaluating the cause of various disturbances in the oral mucosa.

Ziskin relates that castration of female rhesus monkeys causes alteration of the arrangement of the prickle-cell layer of the alveolar and areolar gingivae, with tissue degeneration. Hypophysectomy also causes marked degenerative changes in the mucous membrane.

The effect of castration upon the mucous membranes of the human being has not been reported. Nevertheless, disturbances at the time of the menopause are very frequent. The premise that this is due to atrophy of the ovary, with resulting imbalance of the anterior pituitary gonadotropic hormones, is unproved. It is a plausible theory, however, in view of the other disturbances occurring at this time.

It has been noted that female patients of excellent nutrition and careful hygiene, observed over a period of years to have clinically normal gingival tissue, will suddenly develop "bleeding gums." These patients are generally in an age group between 45 and 55. Sometimes, the condition is transient, but it may recur with increasing frequency, and sometimes it persists.

One such case I saw in the summer of 1940.

A white woman, aged 53, had had a hysterectomy with removal of one ovary seven years previously. She had had no untoward symptoms following the surgical procedure. About three months prior to her visit, she had noted that the gingivae bled freely. She had also begun to have "hot flushings." Examination of her mouth revealed no local cause for the condition. There were no irritating dental restorations nor was any calculus present. She was, therefore, referred back to her physician, who administered hypodermic injections of estrogen (dihydrotheelin), with prompt recovery.

Very favorable results have been obtained in hyperplasia of the gingival tissue from the topical application of estrogen in a suitable medium. This method of application had been used with success in other parts of the body before it was tried in the mouth. It was noted early in the work with the hormone that application to the vaginal membrane caused stratification of the epithelium. After this observation, it was tried in the treatment of gonorrheal vaginitis in children, with excellent results.

In atrophic rhinitis, the hormone has been used with marked success. Mortimer, Wright and Collip treated twenty-one females and seven males by applying estrogenic substance to the inside of the nose. The success was so marked as to cause them to conclude that this form of therapy was the most effective for ozena. Effective results in the treatment of ozena have not been obtained by the hypodermic or oral administration of the drug. The reason for the successful results from topical application is obscure.

Ziskin[10] was one of the first observers to use estrogen topically for gingival hyperplasia due to estrogenic dysfunction. More recently,[11] he reported favorably, as I did, on results obtained by the application of monobenzoate of estradiol directly to the affected parts. The preparation was an ointment suitable for application to the oral tissues. This was held in place against the affected tissues by means of a trough made of modeling compound and allowed to remain for thirty minutes.

The use of estrogenic therapy was discussed recently by Fuller Albright,[13] of

the Department of Medicine of Harvard Medical School, in the treatment of postmenopausal osteoporosis.

He says:

Adult bone is normally subject to two continuous processes, formation and resorption. The mass of bone may be deficient either because resorption is too great or because formation is too little (osteoporosis or osteomalacia). Formation of bone may be too little either because the osteoblasts do not lay down sufficient osseous matrix or because the matrix, once laid down, is not calcified. The former is osteoporosis, the latter, osteomalacia or rickets.

Diet plays an important part in osteomalacia, lack of calcification of the matrix, but its part in osteoporosis is more obscure.

Emphasis is placed on the fact that osteoporosis, insufficient osseous deposition, is not a disorder of calcium metabolism, but rather an atrophy of bone matrix. Factors in osteoporosis are disuse and senescence. Because of the constant tendency of osteoporosis to occur in women after the menopause and the beneficial effect of estrogen therapy on the retention of calcium in this condition, Albright believes that the postmenopausal state is the most common etiologic factor. He reaches this conclusion after a study of forty-five patients under the age of 65, only two of whom were men.

We are well aware of the effect of endocrine disturbances upon gingival tissue, some phases of which are described earlier in this paper, but the work of Albright certainly leads one to the interesting speculation that the disease of obscure etiology known variously as "diffuse atrophy of the alveolar bone" (Gottlieb), "complex periodontosis" (Box), "genuine paradentosis" (Becks) or periodontoclasia may be a true osteoporosis and that it may be subject to control by the sex hormones.

Illustrative of this is a case seen by me in 1934.

A white woman, married, aged 28, had had two pregnancies. The first did not go to term, the second was normal. She had a severe periodontal pocket, of the diffuse atrophy type, on the lower right incisor. There was no calculus present though there was some granulation tissue in the pocket. The patient was highly emotional, weeping at a question about a hypertrichosis of the chin. Because of her emotionalism and the distribution of the hair, she was referred to an endocrinologist, who prescribed what was known at that time as "whole ovary." The patient has taken this substance rather regularly ever since, discontinuing it during pregnancies, of which she has had three more, all terminating successfully. During this period, she had had no recurrence of the alveolar lesion.

It seems that there was sufficient estrogenic substance in the ovarian preparation to maintain the gingival tissue in normal health.

Dietary and endocrine disturbances are the most frequent of the systemic disorders. However, others which are less frequent must be borne in mind. Blood dyscrasia, such as the leukemia and anemia, often causes a gingivitis which, in some instances, progresses to an ulcerative state which must be differentiated from Vincent's infection. The acute exanthematous diseases occasionally are first manifested on the gingivae.

SUMMARY

The causes of gingivitis may be local or systemic or both.

Locally, the deposition of calculus acts as an irritant. Its deposition is affected by the concentration of calcium salts in the saliva, the presence of micro-organisms on the teeth, the pH of the pocket solution and the carbon dioxide of the saliva, as well as the acid-base reaction.

Herpetic lesions of the gingivae may be due to direct contact with an allergen, causing a gingivitis.

Systemically, gingivitis is most frequently due to two conditions, an inade-

quate diet or a disturbance in endocrine balance.

Other possible factors in the disease, such as blood dyscrasia and the onset of acute febrile diseases, must not be overlooked.

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CANCER OF THE FLOOR OF THE MOUTH

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WHILE cancer of the mouth is of frequent occurrence, primary cancer of the floor of the mouth constitutes only a small percentage, about 3, of all such cases. However, although it comprises such a small percentage of oral cancers, its rapid growth and destructive tendencies establishes it as one of the more serious types of cancer within the mouth.

From the dental standpoint, it is one of the most readily noticeable growths and, when recognized early, permits of curative treatment in many instances. If neglected, however, cancer of the floor of the mouth develops into an extensive destructive ulcer of the mucous membrane, with early invasion of the musculature and with frequent extension into the mandible; and, in that condition, such lesions are not controllable by any therapy at our command. We therefore are warranted in expecting the dentist to be familiar with such lesions.

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INCIDENCE

Like cancer in other parts of the oral cavity, carcinoma of the floor of the mouth occurs most frequently in males, between the fourth and fifth decades.

ETIOLOGY

As in all malignant lesions of the mouth, syphilis, the use of tobacco and irritating dental conditions serve as important factors in the etiology of cancer in this area.

PATHOLOGY

In nearly all cases, a cancer of the floor of the mouth is a squamous-cell epithelioma. Sometimes, a transitional-cell epithelioma is found and, in rare instances, an adenocarcinoma develop-

ing from the salivary tissues may occur.

The lesion originates in the mucosa of the floor of the mouth, commonly around the orifice of the submaxillary duct on either side of the frenum, and rapidly extends to the undersurface of the tongue, to the gingival and buccal mucosa and, in some cases, to the lips. It is a slow-growing, but a rapidly invasive lesion, readily piercing the adjacent musculature of the floor of the mouth and, at times, even invading the jawbone. Its spread through the lymphatics is early, involving the submaxillary nodes, the superior and deep cervical nodes and, when the lesion is in the anterior portion of the floor of the mouth, the inferior deep cervical and the submental lymph nodes.

DIAGNOSIS

Not all lesions of the mouth are malignant, but often the forerunner of cancer may be an infected ulcer associated with syphilitic leukoplakia and unsatisfactory dental conditions. Cancer must be differentiated from infection, benign leukoplakia, syphilis, tuberculosis and benign granulation.

Infectious ulceration rarely has indurated edges, is quite painful and diffuse and, in most cases, is associated with other signs of infectious disease. It clears up with appropriate medication.

Leukoplakia of the mouth, one of the most frequent precancerous lesions, may be due to infection, syphilis or irritation. Persistent irritation of a leukoplakia associated with syphilis and serious dental conditions often leads to cancer. If wartlike growths appear in this ulcerated area, carcinomatous development of the leukoplakia is probably indicated. In benign leukoplakia of syphilitic or infectious origin, chemotherapy, in most instances, cures the lesion; whereas, if carcinoma is present, healing does not follow such therapy.

Where hygienic and chemotherapeutic measures fail to clear up a suspected lesion, biopsy should be performed for diagnosis. In cancerous leukoplakia, the margin is firm, indurated and invasive. In leukoplakia of benign character, local destruction by the electric cautery may result in complete healing.

Traumatic lesions are usually benign, and the resultant area of ulceration and granulation is soft, not indurated or invasive. Often, such lesions are associated with salivary duct calculi which impinge on the mucosa or ulcerate through it. With the removal of the traumatizing agent, the lesion readily heals.

Tuberculosis of the floor of the mouth is always associated with active tuberculosis of the lungs. It appears as an irregular, shallow, extremely painful ulcer without indurated edges. The bacilli are found in some lesions.

In actinomycosis, mutiple sinuses extending from the floor of the mouth through the skin of the jaw and neck are common. The sinus openings are surrounded by heaped-up granulations and the pus exuding from such sinuses contains the yellowish ray fungus, which causes the disease.

SYPHILIS

In about 40-50 per cent of all oral cases, syphilis is a concomitant of cancer and often its ulcer covers the underlying malignant lesion. The failure of a lesion to disappear with syphilitic therapy should suggest malignancy. Syphilis sometimes appears as a primary chancre, but more often as a gumma. It is a painless lesion, not usually accompanied by local lymphadenopathy. Antisyphilitic therapy often alleviates this condition, especially if cancer is not associated with it.

Cancerous lesions are slow growing, ulcerated, hard, indurated and invasive. In many instances, the draining lymph nodes are enlarged and palpable. The ulceration may not be painful except when secondary infection occurs and

erosion exposes nerve or bone tissue, in which case it is apt to be quite painful. The induration may involve the mucous membrane of the tongue, cheek or alveolar ridges, the adjacent musculature, the maxilla and the associated lymph nodes, and, in advanced cases, the overlying skin of the neck. Occasionally, instead of being ulcerated, the lesion is a bulky mass that extends into the substance of the tongue and pushes the tongue up to the roof of the mouth, almost completely obliterating the oral cavity. Biopsy should be performed in all cases to confirm the diagnosis and to determine the histologic character of the lesion.

TREATMENT

Mouth Hygiene.—Treatment consists of (a) mouth hygiene, (b) active therapy of the local lesion and (c) treatment of the metastasis. Treatment of the local condition will depend upon the site, extent and character of the lesion and the presence of metastasis. The first essential factor in all forms of treatment is mouth hygiene. Bad teeth must be removed and poor dentures be replaced. Necessary tooth extractions must almost always be made before irradiation. Subsequent extractions may, because of devitalization due to irradiation, cause destructive changes in the bone with resultant slough, osteomyelitis and even loss of the whole mandible. The presence of infection will diminish the effect of irradiation and retard healing. When syphilis is a concomitant condition, cleaning of the infected processes and antisyphilitic therapy are carried out before local irradiation.

Local treatment follows hygienic care of the mouth. This may be either surgical interference or irradiation. Irradiation may be carried out by means of x-rays or radium. In a lesion involving only a limited area of the mucosa, surgical excision may remove the whole lesion. In more extensive growths, especially where the malignant condition may extend into the surrounding tissues, surgical procedure is inadvisable. Extreme, radical surgical procedure, in the face of the better results from irradiation, is contraindicated.

Irradiation.—Two methods of irradiation are available, x-ray and radium. For x-ray therapy, several methods are employed. The local lesion may be treated by (a) direct contact low voltage x-rays, (b) by intra-oral high voltage x-rays or (c) by high voltage x-rays applied through several exterior portals of the neck, with the rays directed through the lesion.

In the direct contact method, the x-ray tube is applied directly to the lesion within the mouth and an intensive dose of lightly filtered, moderately penetrating, caustic x-rays is administered within a short period of time (Chaoul method). This method is too recent to be evaluated at the present time.

In the intra-oral treatment with high voltage x-rays, the heavily filtered x-rays are administered directly to the lesion through a narrow collimating cylinder, giving either a few large doses, or many daily fractional doses (Coutard method). The cervical nodes are simultaneously treated, the rays being directed through the neck. The dosage is determined by the site and extent of the lesion and the method of x-ray therapy employed. The number of portals used for external x-ray therapy depends on the extent of the lesion and the dosage planned.

Radium therapy may be administered either by (a) interstitial application or (b) by placing surface applicators directly over the local lesion and/or applying them to the outside surface of the neck.

By experience, we have found that interstitial irradiation is not so beneficial in lesions of the floor of the mouth as is treatment with surface applicators.

In large, bulky lesions, before irradiation, one may remove the excess tumor

tissue either by electric cautery or surgically; then implant radium needles interstitially. The latter method has proved more effective than implantation of radium seeds.

For surface radium application, radium tubes may be placed with rubber sacks and sutured over the area to be treated; or a wax dental mold to which several radium tubes are fastened may be fixed over the area to be treated and held in place in the usual manner of mouth dentures. The number of radium tubes required and the dose given depend on the size and extent of the lesion. In some patients, a double mold type of treatment is carried out. When a radium denture is placed within the mouth, a second mold carrying radium tubes is attached under the chin so as to crossfire the lesion through the floor of the mouth. Intra-oral radium dentures are made with lead protection barriers to avoid necrotizing effects on adjacent healthy tissues, the tongue, alveolar ridges and bone. When large quantities of radium are available and intra-oral irradiation is not well tolerated, treatment may be administered through the neck by means of a large radium pack. This form of telecurietherapy may be carried out with a large, single pack directed through several areas or by a collar applicator attached to the neck, carrying the appropriate amount of radium properly distributed on its surface.

With regard to the question of metastatic neck nodes, lymphadenopathy is, in my opinion, always a serious condition. I agree with Duffy that "where secondary nodes are freely movable, confined to one side of the neck and the local lesion is curable or cured, the operative removal is advisable." Otherwise, surgical interference is contraindicated and irradiation is the method of choice. It has been our practice to advise irradiation of the neck lymph drainage areas in all cases of mouth lesions even though metastatic nodes were not palpable. Irradiation, we believe, inhibits further extension into the lymph nodes. It is done with high voltage x-rays or, where large amounts of radium are available, with a radium pack.

Dental lesions may occasionally follow intensive irradiation. These vary from superficial ulceration of the gingival mucosa and dental caries to processes destructive of the teeth and the maxilla. However, where hygienic measures have been taken before treatment with either x-rays or radium is instituted, such sequelae are not frequent.

PROGNOSIS

The prognosis in cancer of the floor of the mouth is always grave. Moreover, in most instances, treatment is requested after the lesion is far advanced. As in carcinoma elsewhere, best results are achieved when the lesion is recognized early and radically treated at once.

RESPONSIBILITY OF THE DENTAL PROFESSION

In the early recognition and the prevention of cancer of the mouth, the dental surgeon plays an important rôle. Dental hygiene is a prime factor. Viewing as suspicious a persistent leukoplakia and confirming suspicions with a biopsy is a highly commendable attitude. Procrastination in diagnosis and incomplete treatment may be fatal to the patient. Early diagnosis and careful treatment, if not always affording a cure, will, at any rate, in many instances, prolong the life of the patient.

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DENTAL EDUCATION IN WAR TIME

ALL agencies representing the profession of dentistry are eager to aid the Government in any possible way in the prosecution of the war. Evidence of the earnest desire of practicing dentists to serve their country may be found in the fact that before Pearl Harbor, there were less than 700 dentists in the Army, the Navy and the Public Health Service, and on February 1, 1943, that number had risen to nearly 13,000, without any complaint, delay or hesitation at any point in the induction of new entrants to these services as rapidly as they have been needed and could be absorbed. Sixteen states have already exceeded their quotas on the basis of the number of practicing dentists resident within their borders as compared with their populations.

The Subcommittee on Dentistry of the Procurement and Assignment Service, State Military Affairs Committees, State Procurement and Assignment Service Committees, the War Service Committee of the American Dental Association and many other closely allied organizations representing dentistry have cooperated steadily in assembling data about the age, distribution, experience and special qualifications of the dentists of the United States and in the establishment of just and equitable quotas so as to meet promptly the month by month demands of the Army and the Navy and, at the same time, to provide for a balanced distribution of dentists remaining at home to provide adequate dental service for the civilian population. The response of the entire profession, having been all

that could be desired, is cause for great satisfaction on the part of all who have justifiable pride in the ethical conduct, the high patriotic impulses and the devotion to duty of the dentists of the entire country.

With equal promptness and zeal, the dental schools of the United States have met the new obligations put upon them in time of war. Shortly after war was declared, the Council on Dental Education of the American Dental Association considered at length the means by which dental education might be modified to aid the war effort more effectively. The Council recommended that all dental schools finding it possible and practicable to do so, without lowering of standards or diminution of curricula, embark upon accelerated schedules so that the usual dental course requiring four academic years might be completed in at most three calendar years. The Council also took the initial steps in urging the Government to provide funds for loans to students pursuing their studies under the accelerated plan. The schools promptly met the issue and all of the dental schools of the United States are now organized and administered on this emergency basis.

This practically continuous employment of the facilities and resources of the dental schools increased the immediate output of dental graduates and materially shortened the calendar time for the completion of dental training for all underclassmen and for all new entrants. This radical and wholesale change in administrative procedure has been brought about with the hearty good will of teachers and students despite the extra burdens it has put upon them. Many schools have encountered difficulties in maintaining their curricula because of the withdrawal of teachers to enter the armed forces. Thus far, however, the fine cooperative spirit of those remaining on the home front has prevented serious dislocation of the established courses of study. Future historians of dental education will not overlook the whole-hearted and intelligent way in which our dental schools have instituted these new procedures and have girded themselves to carry on for the duration.

Recalling vividly the awkward blunders of the administration of the Students' Army Training Corps in World War I, which, but for the providential Armistice in November 1918, would probably have led to the collapse of higher and professional education, we have hoped profoundly that dental education might be spared military regimentation during this war. With every wish to see competent dentists provided promptly and unhesitatingly for the Army and the Navy, as they happily have been and, we believe, will continue to be, we are concerned about the working out of a system of dental education "by contract" with the Army and the Navy. We gravely question whether the common end to be gained, about which there is no debate, may not be accomplished more economically, more expeditiously, with sounder educational procedure, with greater assurance of a steady supply of new entrants to dental practice to meet civilian as well as war service needs and with greater safety for the future of the profession, by the conduct of the dental schools free from the inevitable effects of Army and Navy regimentation. The grounds for this view, shared, we believe, by all who are acquainted with the development and progress of dental education in this country and by all who have any participation in the present administration of the dental schools, we think it worth while to record.

In 1935, the American Association of Dental Schools completed and published a notable and exhaustive self-survey under the caption "A Curriculum Survey Report." As a direct result of this scholarly and searching inquiry, the dental schools by common consent moved to the so-called 2-4 plan; namely, to a minimum of two years of predental education in an approved liberal arts college and to four years of professional training in a dental school. The entire curriculum was evaluated and analyzed in the report, and suggestions were made as to scope, content and objectives of separate courses, and while no effort was made to reduce the schools to a uniform type, the subsequent employment of the findings presented in the report as a point of departure for the organization and administration of a dental school curriculum has been universal.

The debate over the scope and content of predental education was long and earnest. Distinguished educators in the field of liberal arts were called in for counsel and advice. There was very general and spontaneous agreement that the minimum of two years of liberal arts education should prevail. The debate came upon the subject requirements. The final preponderant judgment was that specifically required subjects should be restricted to the lowest possible minimum in order to give the individual student the widest possible range of choice of liberal studies. Accordingly, specific requirements in the predental program were limited to English, biology, physics and chemistry. Many deans of liberal arts colleges questioned the validity of some of these subjects as absolutely essential to the beginning of dental study and still question it. A compromise was reached, however, and the liberal arts programs in predental education for the last seven or eight years have been promulgated upon that basis.

The Council on Dental Education came into the picture some time after the Curriculum Survey Report had been issued. The Council, in the Requirements for the Approval of a Dental School, first published in December 1940, undertook still further to liberalize the predental requirements by discontinuing the use of the semester hour as a basis of measurement, specifying, instead of a given number of semester hours in each subject, a year in English, in biology, in physics and in inorganic chemistry and a half year in organic chemistry. This change was made because the semester hour as a measure of progress or accomplishment is being abandoned in some leading colleges and because a legitimate year's work in thoroughly acceptable institutions was found to vary from five to eight semester hours. The Council holds that exact mathematical measurements do not necessarily give proof of satisfactory training and that the disciplines in these subjects —whatever they are—are to be measured more reliably by the good faith and recognized standing of the liberal arts colleges in which they are pursued than by exact length or semester hour value. The Council is, therefore, willing to recognize as acceptable a year course, or a half-year course, when so designated, pursued in an approved liberal arts college without reference to an exact semester hour specification. Moreover, the Council is willing to waive specific requirements in biology and physics for exceptional students with three or more years of liberal arts education, believing that superior scholarship, in whatever area of liberal studies, is even more to be desired than rigidly fixed subject requirements. These efforts at liberalization have had the cordial approval of many liberal arts

colleges. The trend certainly is toward a well-rounded program of predental studies with as wide a latitude as possible for individual choice by the student and with opportunity for the liberal arts college advisor to organize the program of a student upon an individual basis.

As a result of the depression of 1929 and the subsequent adoption of the 2-4 plan, the enrollment in the dental schools of the United States dropped markedly, and did not begin to move definitely upward until the academic year 1939-1940. The total number of graduates in 1941 was 1,568, the smallest number, with three exceptions, in forty-five years. These exceptions occurred in 1930, with 1,561 graduates; in 1920, with 906, and in 1896, with 1,432. Before 1897, the number had always been less. On the other hand, the gradually increasing enrollment of the last few years brought the total number studying dentistry as of October 15, 1942, up to 8,847, the largest number since the academic year 1926-1927. The academic level of the liberal arts college credentials perhaps reached the highest point in 1942. The predental liberal arts training of the 8,847 undergraduates enrolled as of October 15, 1942, stood as follows: with less than two years, 3; with two years, 4,338; with three years, 1,740; with four years without a degree, 366; with a bachelor's or other degree, 2,400. There has been a steady increase for several years in the number of students offering credentials for admission beyond the minimum specifications. About one-half of those normally beginning dental study still plan to begin their professional study at the conclusion of two years' work in liberal arts.

This point we would especially emphasize: Before Pearl Harbor, various reliable studies indicated that we had a shortage of dentists in the United States. The total number of graduates in 1941, as we have shown, was 1,568. It has been carefully estimated that we would need at least 2,250 graduates annually in normal times—and we believe the figure should be higher—to replace those who die or retire and to meet demands of a gradually increasing population. This estimate was made on the assumption that it is desirable and necessary to maintain the prevailing ratio of dentists to population, which, before the present emergency arose, was roughly one dentist to 1,800 persons. It should be kept clearly in mind, therefore, that, on careful estimates, we have had a shortage in civilian replacement needs for several years. The trend was upward, however, before the emergency, the graduating class of 1942 numbering 1,784. Undisturbed by the war, we should have reached a satisfactory equilibrium in enrollment and graduation in four or five years.

All these nice calculations were upset by Pearl Harbor and the consequent demands of the Army and the Navy. Up to February 1, 1943, nearly 13,000 dentists had been withdrawn from civilian life, and it is expected that 9,000 more will be called to the service within the next year. This will mean that our ratio of dentists remaining at home to serve the civilian population will be radically changed from one to 1,800 to perhaps one to 2,500 persons. The shortage which was in evidence before the emergency arose is now more apparent.

There is genuine cause for concern that the situation may grow progressively more serious, especially if the war should continue for a considerable time. It seems unfortunate that the announced plans of the Army and the Navy do not

take into direct account the growing need of the civilian population for adequate dental care. Under present plans, the Army and the Navy propose to enter into contractual relations with the dental schools for the training of enough dentists merely to meet their replacement needs. As we understand the matter, the Procurement and Assignment Service originally recommended that enough students be ear-marked and deferred in high schools and in liberal arts colleges to maintain the enrollment on the basis of the entering classes in 1942; namely, 2,702 new students each year. What the reasons were for the apparent rejection of this proposal, which seemed to us eminently sound, we do not know.

The Army estimate of needed replacements every nine months is 825; the Navy estimate is 400. Since it is reliably estimated that about 16 per cent of those who enter upon dental study will not graduate, the Army will apparently be obliged to admit 982 to each new class, the Navy, 475. This will make a total of 1,427 students to be admitted with each new class under the auspices of the Army and the Navy. This is 53 per cent of the total number of 2,702 admitted in 1942.

The assumption apparently is that the additional students to maintain the present highly necessary level of enrollment may be recruited from women and men who are physically disqualified for service with the armed forces. This assumption seems to us not well founded. There have never been a very large number of women enrolled in dental study. The total for the entire country last year was seventy-three. Even if it should be deemed desirable and wise to fill the schools with women at this time, we gravely doubt whether they could be recruited in sufficient numbers. Trends of this character do not develop overnight. Moreover, in our judgment, there is even less prospect of the enrollment of physically disqualified men in sufficient numbers to make up the deficiency. Dentistry calls for good health and a rugged constitution. It is not likely that many men rejected by the Army and the Navy for physical reasons will have the hardihood to seek to enter a profession which calls for rigorous physical discipline in training and throughout one's professional career.

It is true that the complicated regulations of the Selective Service seem to indicate a possibility that physically qualified young men, in addition to those admitted to dental schools under the direct auspices of the Army and the Navy, may be deferred long enough to secure a dental education on their own responsibility. Even if it turns out that this type of enrollment is possible, it seems to us a forlorn hope. What able-bodied young man, pronounced physically and mentally qualified for service with the armed forces, will wish to enroll in the study of dentistry as a civilian, even though duly deferred, alongside the young men who will be inducted into the Army or the Navy, put in uniform, housed, messed and instructed free and paid $50 a month? We fear that adequate consideration has not been given to the pressing needs of the civilian population for dentists and that these plans of the Army and the Navy to take over the dental schools may result in a marked reduction in the total enrollment when, by every conceivable angle of public health and war-time needs, the dental schools should be operated at their full capacity.

We go even one step farther in our deep concern in this matter. An examina-

tion of the specific requirements of the Army and the Navy for the conduct of their specialized training programs in dentistry raises the question as to the possibility of recruiting even enough dental students to meet their contemplated replacement needs because admission to dental schools is hemmed about with specific additional requirements. Colleges, universities and accrediting agencies uniformly make announcement of contemplated changes in admission and graduation requirements well in advance of the time when they are expected to take effect. This is done in fairness to both students and teachers in order to give ample time for the inevitable readjustments which will be necessary. We find it difficult to fathom the reasoning which has prompted the Army and the Navy to institute radically revised requirements for admission to the study of dentistry at this time.

Let us look first at the announcements of the Army plan. The minimum predental requirement of two years of liberal arts education in an approved college, prescribed by the Council on Dental Education, accepted by the schools and organized and offered in orderly fashion in hundreds of liberal arts colleges, is stepped up from the conventional 60 semester hours to 83 semester hours. The present requirement gives room for a free choice of electives covering about one-half the course. The Army plan specifies rigidly 61 of the 83 required hours and restricts the 22 so-called elective hours to a limited area of subjects. Stated in another way, the present requirement covers substantially one-half of the work required for a bachelor's degree with a wide choice of electives; the Army plan covers more than two-thirds of the work required for a bachelor's degree with a restricted field of electives. The Army requirement covers all the subjects specified by the Council and adds to the requirements in biology and chemistry. Eight hours in mathematics presents a wholly new requirement. An integrated course covering 15 hours in English, history and geography adds history and geography as new requirements. This integrated course will present serious difficulties on short notice to liberal arts colleges, especially in finding a sufficient number of qualified teachers in geography.

It is to be noted that the predental requirement thus prescribed by the Army is to be met in an intensive, accelerated course of five terms of twelve weeks each. Each student will be obliged to carry what would amount to substantially 20 hours a semester on the basis of a conventional two-semester academic year. This is a maximum load. The students engaging in this work will be comparable in age, in intellectual capacity and in ability to carry heavy schedules, with the usual freshmen and sophomores in liberal arts colleges. It is rare indeed that a freshman or a sophomore is permitted to register for more than 15 to 17 hours. Here, we have the apparent assumption that all students will be of superior intellectual capacity and able to carry a maximum load under an accelerated plan. Nature does not turn out students in such agreeable fashion.

Let us now turn to the predental requirements prescribed by the Navy. Here, the two-year predental minimum requirement, conventionally 60 semester hours, is stepped up to 85 semester hours with 82 hours rigidly specified and 3 elective hours. Here also, the biology and chemistry requirements are increased and the following new subjects are introduced: history, mathematics, modern language,

psychology and naval organization. The Navy course does not oblige the student to carry an extraordinarily heavy load, for the entire course covers five terms of sixteen weeks each.

The accompanying comparative table will show the situation. We should like to pose these questions:

1. Upon what grounds do the Army and the Navy justify a marked increase in the predental requirements at this time?

2. From the standpoint of the Government, which is back of the Army and the Navy, why is it necessary and wise for the Army to set up a course of five terms of 12 weeks each and the Navy a course of five terms of 16 weeks each?

3. Why is geography essential for an Army candidate and not for a Navy candidate?

4. Why are psychology and a modern foreign language essential for a Navy candidate and not for an Army candidate?

PREDENTAL REQUIREMENTS

Subjects*	Semester Hours		
	Council on Dental Education	Army Plan	Navy Plan
English	(One year) 6		6
History	0	Integrated	4
Geography	0	Course 15	0
Mathematics	0	8	10
Modern foreign language	0	0	15
Biology	(One year) 6	12	13
Physics	(One year) 6 or 8	8	6
Chemistry	(1½ years) 12	18	19
Psychology	0	0	7
Naval organization	0	0	2
Electives	28	22	3
Totals	60	83	85
Terms	4 of 16 weeks	5 of 12 weeks	5 of 16 weeks
Academic years	2	2.7	2.8

*Physical training is also required by Army and Navy.

Happily, up to this date, the Army and the Navy have announced no change in the dental school curriculum as at present prescribed by the Council on Dental Education and administered by the schools. There is much evidence, however, of the purpose of both the Army and the Navy to employ "screening" processes to determine what students should be advanced from time to time and what students should be allowed to continue their dental studies. We wish that the dental schools might be left free in the exercise of their own good faith and be trusted to weed out the incompetents and to advance and graduate the qualified in war time just as they do in peace time. If the schools are competent within the purview of the Council on Dental Education to set up a satisfactory curriculum, they surely ought to be competent to administer it.

It is now possible, we hope, to stand aside and take a look at the total picture. According to our latest information, neither the Council on Dental Education nor the American Association of Dental Schools was called into consultation at

any stage in the development of these plans by either the Army or the Navy. It is true, we understand, that certain individuals and certain committees, not representing either of these agencies, were consulted or, it might better be said, were notified as to what was being planned. It seems unbelievable, but it is the sober fact, that Army and Navy officials would lay out plans for taking over dental education, reorganize and greatly modify the predental requirements and set the stage for regimentation of the dental schools without even recognizing the existence of the two agencies principally responsible for the present conduct and status of dental education.

After all this military machinery does its work, it will transpire, we predict, that there was really no occasion or necessity for doing anything. What more do the Army and Navy want than a steady flow of well-trained dentists to meet their replacement needs? The dental schools could have gone on and would have gone on cheerfully without any overlordship or regimentation and, indeed, without any financial aid. The provision of Federal funds for loans to students unable to get on without help under the accelerated schedules was gratefully acknowledged, and even now some schools would be strengthened by subventions to help meet the added cost of administering a continuous teaching program. Neither schools nor students have asked for anything else. Allowed to carry on their work undisturbed, the schools would have continued to enroll new classes on the present basis of admission and number with completely accelerated schedules and with the assurance that the reasonable and tremendously important needs of the civilian population and the literal demands of the Army and the Navy would be met. All the Government needed to do was to establish a sensible working scheme for the deferment of enough bona fide high school and liberal arts college students to sustain the present enrollment in dental schools. And let us record here in unmistakable terms that our concern is not to keep any dental school alive for its own sake: our concern is that the dental needs of all of our people at home and on the firing line shall be met and that we shall not find ourselves at the end of the war with a disastrous shortage of dentists.

We hear much these days about conserving manpower and about keeping down the cost of government. The whole scheme of regimentation in medicine, dentistry and veterinary medicine will eventually, we believe, break down of its own confusion and be shown to have been a needless expenditure of manpower and money. So far as dentistry alone is concerned, it will require hundreds of Army and Navy officers and extramural experts to operate the bureaucratic machinery that will inevitably develop and thousands upon thousands of dollars to house and clothe and mess and regiment the students. With all the pressure that the Government is now obliged to exert to get men and money, it seems nothing short of sheer waste to interfere with the orderly processes of dental education, which could and would be carried on without the aid of military men and with little or no cost to the Government.

We yield to no agency in our whole American life in our desire to see the war prosecuted with all possible vigor and in our desire to see the profession of dentistry meet on the dot every demand the armed forces make upon it. We do not believe that regimentation of the dental schools is necessary to this end. We

have no manner of doubt that the responsible administrators and teachers in our dental schools share our view. It is generally acknowledged that dental education and dental practice in America lead the world. That situation has come about primarily from within the profession—a profession which we believe the Government could now trust to do its full duty without regimentation. Here is a splendid opportunity to save men, money and red tape. We indulge the hope—none too confident—that it is not yet too late for the Army and the Navy to turn the dental schools back to civilian administration.

AMERICAN ASSOCIATION OF DENTAL SCHOOLS
TWENTIETH ANNUAL MEETING

The American Association of Dental Schools, an organization made up of the faculties of the various dental schools of the United States and Canada, is concerned with the formulation of the dental educational curriculum pursued by the dental schools and the means for prosecuting it in a manner that will meet the needs and demands for dental service to the public.

At a time when the Government is contemplating commandeering all the professional medical and dental schools, as well as the academic schools that are entrusted with the academic preparation of the prospective students of medicine and dentistry, the activities of this organization become of such vital importance that a brief running account of its proceedings at the recent meeting in Chicago seems desirable.

We offer this account and an accompanying editorial critique of the manner in which the representative dental educational body of dentistry has been pushed aside by the Army authorities in planning educational procedures during the emergency, to draw the attention of the profession to the present status of dental education and, if possible, to impress upon the Army educational authorities the importance of greater consideration of the rôle which this body has played in designing and prosecuting the present dental educational program.

This association is directly sponsored by the American Dental Association and its actions are representative of the mature thought and experience of a group of educators to whom has been delegated the responsibility for the dental educational product best suited to our needs.

The theme of the annual meeting was collaboration with the Army authorities in providing efficient and capable dental service to the Army in the present emergency.

The Twentieth Anniversary Meeting of the association convened at the Drake Hotel, Chicago, March 15, 16, 17, 1943, with full representation from all thirty-nine member schools.

At the first general session, on Monday morning, the president, B. E. Lischer, dean of Washington University, presented the annual president's address under the title "University Dental Education." He reviewed the activities of the Association for the previous year and outlined the aims, ideals and purposes to be kept in mind in this most critical crisis in dental education.

Emory W. Morris, director of the W. K. Kellogg Foundation, presented an analysis of the Foundation's work in "Continued Education." Dr. Morris expressed the great satisfaction that the Foundation had derived from its assistance to the cause of dental health education and assured the association of the Foundation's interest in dental health projects of the future.

Robert P. Thomas, secretary of the National Association of Dental Examiners, presented an analysis of the problems confronting state boards because of the war and the accelerated schedules in dental schools. His contribution also emphasized the growing cooperation between the various educational groups and the necessity therefor.

Monday afternoon was devoted to group sessions. Section I discussed administrative problems confronting dental schools; e. g., maintaining a faculty during war time; difficulties of the accelerated program, and provisions for the retirement of dental teachers. Section II was given over to a discussion of the problems of restorative dentistry; Section III, to oral surgery and medicine.

At the annual dinner on Monday evening, Prof. Clark Kuebler, of Northwestern University, delivered an inspiring and instructive address on "Higher Education in the Post-War World." This was followed by a travelog by Dr. Stanley D. Tylman, of Chicago, describing his recent lecture tour of South American dental schools.

The general session on Tuesday morning provided four papers on such varied topics as "Junior Dental Associations," "Latin American Dental Schools" and the "Orientation Course for Freshman Dental students." A round table luncheon on Tuesday opened with an interesting discussion of "Dentistry in Total War," by Dr. M. Don Clawson, of Nashville, Tenn., which was followed by seven enthusiastic round table conferences on the clinical divisions of dental education. The Tuesday evening session in the grand ballroom was devoted to military

aspects of dental education. Harold S. Diehl, dean of the University of Minnesota School of Medicine, presented a comprehensive discussion of the "Problems of Procurement and Assignment" and Gerald D. Timmons, dean of Temple University, ably discussed "Dentistry in the War Effort." The general discussion was led by John T. O'Rourke, dean of the University of Louisville, School of Dentistry.

The theme for the Wednesday morning session, "Who Should Teach Dentistry?" was under the leadership of W. D. Postle, dean of Ohio State University. Dr. Harlan H. Horner, secretary of the Council on Dental Education; A. J. Klein, dean of the College of Education, Ohio State University; L. F. Edwards, professor of anatomy, Ohio State University; Charles W. Freeman, dean of Northwestern University Dental School, and W. H. Crawford, dean of Indiana University School of Dentistry, contributed vigorous and incisive discussions on this all-important theme.

All sessions of the meeting were well attended. The meeting adjourned on Wednesday afternoon after a brief business session, at which the reports of standing committees were presented, followed by the election of officers. The next annual meeting, in March 1944, will be held at the Drake Hotel.

DEATH OF WILLIAM H. G. LOGAN

It is with exceeding sadness that we announce the sudden death of William H. G. Logan, which occurred April 6, 1943, at his home in Chicago.

A full obituary notice of Dr. Logan will appear in our June 1 issue.

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WAR SERVICE COMMITTEE

CHANGE IN AGE LIMIT OF DENTISTS ELIGIBLE FOR COMMISSIONS

THE following release to state Chairmen for dentists in states having quotas for 1943, dated April 8, 1943, regarding change in age limit of dentists eligible for commissions, has been issued by the Directing Board of the Procurement and Assignment Service:

It has been obvious for some time that it will be difficult to fill state quotas for dentists within the upper age limit of the 39th birthday. The Officer Procurement Service is announcing to their district offices that this limit has been increased to 42. However, their willingness to do this was dependent upon assurance from Procurement and Assignment Service that each State Chairman would submit the names in chronological order, that is, all available dentists aged 38 and under until the supply is exhausted, then all available dentists aged 39 until the supply is exhausted, and then those aged 40 and 41 in turn. Their hope is, of course, to fill the ranks with those under 40 if possible.

Your cooperation in this plan will be greatly appreciated since it is essential to the revisions in the upper age limit set by the Office of the Surgeon General.

The Officer Procurement Service is also notifying their district offices that commissions will be extended to dentists between the age of 42 and 44 inclusive who are classified 1-A by their local draft boards, provided the reclassification was not at the request of the dentist, but was a routine classification by the local board.

C. WILLARD CAMALIER, *Chairman.*

COMMITTEE ON LEGISLATION

ARMY DENTAL CORPS

FOR a number of months, the Committee on Legislation has been receiving many communications from all over the United States relative to the urgency for some definite action to secure more direct authority for the Army Dental Corps. There is no doubt of the need of a more direct approach from the different dental installations through the Dental Corps to the chief of that Corps and thence to the Surgeon General.

From every quarter, the demand for a separate Dental Corps is growing. However, since the work of the Medical Corps and that of the Dental Corps are so closely allied, it is believed by those who have studied the problem that a complete separation of the Dental Corps from the Medical Corps would hinder the effectiveness of both corps. It is felt, however, that problems of control and efficiency within the Dental Corps could best be handled by dental officers. Undoubtedly, the welfare of the Dental Corps

Statement from the chairman, Sterling V. Mead, D.D.S., Washington, D. C.

could be improved by a more equitable plan of promotion of its officers, with some regard to parity with the ratio formerly proposed by Congress for medicine and dentistry.

There is every reason to believe that if the plan is worked out for a more direct approach for dentistry, with more authority for the Dental Corps, and especially in the handling of equipment and supplies and with regard to the promotion of the officers, there will result a definite saving of time and money and there will be a more efficient Dental Corps.

In 1917, Congress passed an act to provide for the promotion of certain officers of the Dental Corps of the Army. The following wording appears in this act:

> Hereafter the Dental Corps of the Army shall consist of commissioned officers of the same grade and proportionally distributed among such grades as are now or may be hereafter provided by law for the Medical Corps, who shall have the rank, pay, promotion and allowances of officers of corresponding grades in the medical corps, including the right to retirement as in the case of other officers.

The Surgeon General of the Army is responsible for the proper functioning of the Medical as well as the Dental Corps, and he should be favorable to any plan that would make for greater efficiency of the Dental Corps, as this would reflect much credit upon his office and be to the advantage of both the Medical and the Dental Corps. An effort has been made by the President of the American Dental Association, J. Ben Robinson, and the chairman of the Committee on Legislation, Sterling V. Mead, to have this matter corrected by departmental procedure. There would seem to be great advantage in a more equitable arrangement both to medicine and to dentistry, especially if a more direct line of communication from the various dental departments to the Surgeon General can be effected.

In the Navy, the Medical service is represented by a surgeon general who is a rear admiral and the rank of rear admiral has been created in the Naval Dental Corps also. In the Army, the Medical Service is represented by a surgeon general with the rank of major general and dentistry is represented by a brigadier general. At the present time, there are approximately 37,000 physicians in the Army and there are approximately 11,000 dentists in the Dental Service of the Army, which is the ratio of about 1 : 3½. By the end of 1943, it is estimated, there will be approximately 17,000 dentists in the Army Dental Corps. It has always been our understanding that this ratio would be carried out both as to numbers and as to opportunities for advancement. However, we find that, in the Medical Corps, there are thirty-one brigadier generals and there is one for dentistry. There is also some discrepancy in the relative ranks of medicine and dentistry in the other grades.

The American Dental Association believes that proper recognition by rank should be given the Dental Corps, considering its present size; that the head of the Dental Corps should rank as a major general, and that the ratio of ranking officers in the dental field to the number of those in the medical field should more nearly approach 1 : 4.

The Committee on Legislation of the American Dental Association is cognizant of the strong feeling throughout the country that something should be done for the Army Dental Corps in the way of promotions and direct approach and for more recognition for dentistry, especially in the administration of affairs in the Dental Corps. However, it must be realized that, to accomplish anything of this nature, it is necessary to have details and accurate information as to just what is necessary and how it can be accomplished. This information, of course, should come from the armed forces; but

because of the reluctance of every one in the Corps to give any information, in consideration of the likelihood of conflict with superior officers, it is practically impossible to get aid or information from this source.

During this military emergency, it will be impossible to get through Congress a bill to make a permanent change in any of the services having to do with reorganization of any kind. The only change that can be hoped for, from a legislative standpoint, is more recognition in the way of temporary promotions, as nearly all promotions at this time are temporary. However, to obtain temporary promotions will aid in obtaining permanent promotions later on. It must be remembered that authority flows from rank, and whenever we are able to obtain greater recognition in rank, there will accrue greater opportunity for departmental changes favorable to the Dental Corps.

A BILL FOR THE ORGANIZATION AND FUNCTIONS OF THE PUBLIC HEALTH SERVICE S. 400 AND H. R. 649

THAT dental disease is more prevalent than any other disease of mankind is common knowledge, having been verified by surveys, most of which have been made by the United States Public Health Service and the American Dental Association. The mouth is subject to more diseases than any other part of the body, and that many systemic disturbances are caused by disorders of the teeth has been lately verified by the physical findings in examinations of men for military service.

In October 1941, President Roosevelt released statistics collected by Selective Service Headquarters showing that approximately 1,000,000, or 50 per cent, of the first 2,000,000 selectees examined for World War II were disqualified for army service because of defective physical, mental or educational conditions. As the first three causes for rejection of the men disqualified because of physical conditions, the Selective Service report listed the following:

Dental defects, 188,000 cases, 20.9 per cent.

Eye defects, 123,000 cases, 13.7 per cent.

Cardiovascular diseases, 96,000 cases, 10.6 per cent.

For years, the American Dental Association has studied ways and means of improving the dental health of the American people. The Council on Dental Health of the American Dental Association has, as its major responsibility, the development of plans and programs that will provide the public with more nearly adequate dental care.

The American Dental Association believes that, considering the magnitude of the problem, the United States Public Health Service has not adequately supported programs for the provision of dental care for the public, nor has it taken the leadership in the field of dental health, as it properly has in other fields of health service. It is the belief that this condition exists, not through lack of interest on the part of the United States Public Health Service, but rather because of the limitations imposed upon the planning and execution of dental programs by medical officers, whose medical training and experience do not provide them with the technical and practical knowledge demanded in this special field. This is evidenced by the fact that, in its reorganization plan (a bill, S.400 and H.R. 649, for the reorganization and functions of the U. S.

Public Health Service), it has failed to make adequate provision for a suitable administrative unit in the United States Public Health Service, which is absolutely essential for the development of a national dental health program.

Notwithstanding the fact that the United States Public Health Service has recommended the creation of separate bureaus or divisions of dentistry in the state health departments, it has neglected to make similar provision in its own reorganization bill for the creation of a separate division or bureau to administer a dental health program on a national scale.

In the course of its work with federal agencies, the National Health Program Committee of the American Dental Association has repeatedly been confronted with the inadequacy of the dental program of the United States Public Health Service. The National Health Program Committee believes that the creation of a separate bureau for dentistry in the United States Public Health Service, with a dentist of the rank of assistant surgeon general at its head, would provide leadership in this department of government for the improvement of the dental health of the nation.

At the present time in the Public Health Service, there are three divisions of dentistry, and one division does not know what the other divisions are doing. There is no correlation of dental service and there is no long distance planning or contemplation of the problems before us. Leadership is not provided. There is a close analogy between the functions of the Public Health Service and the military services so far as dentistry is concerned. However, in the Navy, dentistry has a rear admiral and a separate division and rank of a parity with that of medicine. In the Army, dentistry has a separate division and a brigadier general.

A bureau of medicine should cover those functions which the physician is specially trained to perform, such as hospital care, care of venereal diseases and industrial hygiene.

A bureau of dentistry should cover those functions which the dentist is specially trained to perform, such as corrective services, hospital care, research and industrial dental hygiene.

If dentistry is made a division under the Bureau of Medicine in the organization plan of the United States Public Health Service, the functions of dentistry will be subordinated to the administration of medicine, which is contrary to the general scheme of medical and dental education and their services under normal civilian conditions. It must be borne in mind that dentistry is a separately organized profession (71,000 dentists licensed as such in the United States), with special laws governing its practice (forty-eight states and the District of Columbia), an independent system of education (thirty-nine dental schools in the United States), a separate professional organization, the American Dental Association (membership, 58,000) and a special literature (more than 100 current periodicals). This vast social function cannot be administered effectively by artificially arranging it as a division of conventional medicine. The profession of medicine is not familiar with dental problems and is not, because of dentistry's special character and purposes, competent to accept the authority and responsibility for an over-all public dental health program.

Sterling V. Mead, chairman of the Committee on Legislation of the American Dental Association, has appeared before the hearing in the House of Representatives and also at a hearing before the Senate Committee on Education and Labor in support of a plan to obtain for dentistry a more direct approach and the status desired. As a result of these hearings and the campaign from all over the United States through these various legis-

lators, Senate bill 400 was reported favorably to the Senate March 25 by its chairman, Senator Thomas of Utah, providing in Section 3, that

> . . . there is authorized to be established in the Office of the Surgeon General a Dental Division and a Sanitary Engineering Division; the chief of each such Dental and Sanitary Engineering Division shall be a commissioned dental officer and a commissioned sanitary engineer officer, respectively, of the regular corps detailed by the Surgeon General, and while each such dental and sanitary engineer officer is so detailed, he shall have the grade, pay and allowances of an Assistant Surgeon General as provided by section 2 of this Act.

This bill has been passed by the Senate and it is hoped that a similar bill will come out of the House. It has been promised by the Surgeon General, with this arrangement, that there will be a direct approach from the various units direct to the Surgeon General through the man assigned as assistant surgeon general for dentistry.

This step forward will be pleasing to all those who are interested in the dental activity in the various services.

INSURANCE COMMITTEE

PROGRESS REPORT

THIS report covers the year from January 1, 1942 to December 31, 1942, as requested by the President in his form letter of January 14, 1943 to all committee chairmen.

Our activities were practically halted until April 15, at which time the war clause was inserted in the coverage of those joining the plan after that date. This limitation of coverage was expected to slow down our progress. As a matter of fact, it has had no bad effect on our advancement. We have had more than 1,000 new applicants, many of whom are actually in the service, bringing our total amount of insurance to a new all-time high of slightly more than $24,000,000 of insurance in force. Your committee had not expected the total to reach this figure until the end of 1943. We are, therefore, one year ahead of our original program laid out four years ago.

Arrangements have been made for a distribution of age survey to determine the percentage of men eligible to apply for the coverage. This information is desired by the Committee in order that it may have more definite information regarding the percentage of members included in the coverage. We feel that the percentage is much higher than is generally realized, when eligibility requirements are taken into consideration.

The subject of lapses is most interesting to the committee because it is indicative of the insurance plan's success or failure. The facts are: Only ninety-three lapses were reported after the January collection, a new all-time low in both percentage and number, and this in spite of the fact that the group is larger now than ever before. As a matter of fact, our lapses are less than 1 per cent as compared with 4 to 4.5 per cent experienced by ordinary life companies. This is interpreted by us as an expression of confidence and satisfaction in the plan and as evidence that our promotion efforts have been understood.

The privilege of conversion has recently been added, for the benefit of present and future policyholders. The old plan provided the right of conversion, without evidence of insurability, at age 51. The new privilege allows the right of conversion to all policyholders after they have been in the group five or more years, irrespective of age or physical condition. Conversion, as you know, means the exchange of group insurance for an

individual policy on the ordinary life, limited payment life or endowment plan at prevailing rates for standard risks. We feel that this new conversion right increases the flexibility of our group plan to the extent of meeting every individual requirement that may be brought about by changes in the financial circumstances of the member insured.

Respectfully submitted,

A. D. WEAKLEY, *Chairman*
FRED A. RICHMOND, *Secretary*

BUREAU OF PUBLIC RELATIONS

THE WILLOW RUN DENTAL PROJECT

WILLIAM R. DAVIS,* D.D.S., Lansing, Mich.

THE great increase in population in the vicinity of the Ford Willow Run Bomber Plant in Michigan has presented some difficult public health problems in housing, sanitation and medical and dental care.

Ypsilanti, nearest to the Bomber Plant, a city of 12,000 in 1940 with ten dentists, suddenly found its population more than doubled and the population of the surrounding territory growing by leaps and bounds. Local dentists were overwhelmed with demands for their services which they were unable to meet and appealed to the Bureau of Public Health Dentistry of the Michigan Department of Health and to the state dental society for assistance in handling the situation. The U. S. Public Health Service was approached and offered to detail a dentist to the area provided the request came from the Michigan Department of Health and the matter was cleared with state dental procurement and assignment and organized dentistry, and also that equipment and other expenses were provided for.

The offer was presented to and approved by a dental advisory committee, the council of the state dental society, the chairman of Dental Procurement and Assignment and local dentists. The request was made, and Dr. George Barnes, of the U. S. Public Health Service, was detailed to the State Department of Health in December and assigned to the local county health department. A committee to have charge of the clinic was set up, consisting of the local county health officer as chairman, a representative of the state dental society, a representative of the local district dental society, residing in Ypsilanti, a representative of the Bureau of Public Health Dentistry of the Michigan Department of Health and a lay representative appointed by the health officer.

A suitable office conveniently located was found and rented at a reasonable rate. Operative equipment was lent to the clinic by the Michigan Department of Health. Chair, engine, cabinets and light were lent by the Children's Fund of Michigan.

Since the problem here is mostly one of too few dentists and not inability to pay for the service, fees are comparable to average fees in the vicinity. Fees collected are used to pay rent and other office expenses and the salary of an assistant. The remainder is to be used at the discretion of committee for other dental health promotion.

A local community council lent the committee $500 for initial expense if needed. Very little of this was used in the beginning, and the income soon was sufficient to allow repayment.

*Director, Bureau of Public Health Dentistry, Michigan Department of Health.

The clinic, which began operation early in January, has been very favorably received and commented upon by the community and local dentists. Local groups have been high in their praise of the attitude of the state and local health departments, state and local dental societies and the U. S. Public Health Service in cooperating to give real assistance in this emergency situation.

This project is not looked upon at all as an example of the way dental service should be ultimately extended to larger sections of the population. It is an attempt to use the available means at hand to meet an emergency until more practical means can be developed.

Services rendered in the clinic consist of extractions, plastic fillings and treatments.

March 10, Dr. Barnes was transferred to the Marine Hospital in Chicago and Dr. N. F. Gerrie, formerly dental director in the Montana Department of Health, now with the U. S. Public Health Service, was assigned to this clinic.

Recently, with the help of the dental Procurement and Assignment Service, one more dentist has opened an office in Ypsilanti for full-time practice, and four instructors from the dental school at Ann Arbor, 10 miles distant, are operating evenings in the offices of four Ypsilanti dentists.

The Council of Dental Health of the Michigan State Dental Society has also appointed a subcommittee to study the dental needs of this and other congested areas in the state and to formulate procedures for dealing with such dental emergencies.

VINCENT'S INFECTION OF THE MOUTH*

HISTORY

POPULAR information concerning Vincent's infection of the mouth first appeared during World War I. The large number of cases among the troops engaged in trench warfare led to its designation as "trench mouth," the term continuing to be used as the popular synonym for Vincent's infection of the mouth.

Detailed descriptions of this disease did not appear in the literature until the last decade of the nineteenth century. However, it probably antedates, by many centuries, the era of Vincent, after whom it is named. Its association with military strife is not limited to modern warfare. The literature contains many references to armies plagued by sore, ulcerated and foul-smelling mouths. From the recorded symptoms, paralleling those of the disease as known today, it may be stated with reasonable certainty that man has suffered from this disease since the early days of recorded history.

OCCURRENCE

Vincent's infection of the mouth is not limited to any age group. The acute type occurs more often in children, adolescents and young adults. The chronic type is more often seen in older adults, usually as a complication of other diseases of the structures surrounding and supporting the teeth. Strangely enough, this disease does not occur in mouths before teeth erupt or after all teeth have been

*The growth of public interest in dental health has resulted in a marked increase in requests for information on different phases of the subject. To meet this demand, the Public Health and Education Committee, now a committee of the Council on Dental Health, has authorized the preparation of a series of twelve articles in pamphlet form, each article to deal with one of the dental questions most frequently asked by the public.

"Vincent's Infection of the Mouth," by Harry Lyons, D.D.S., is the fifth of this series. Reprints can be obtained by addressing the Bureau of Public Relations, American Dental Association, 222 E. Superior St., Chicago, Ill.

lost. The explanation of this phenomenon is that a so-called incubation zone, free from oxygen, is necessary as a harbor in which bacteria may lodge and thrive. Such a zone in the mouth is supplied by the unattached portion of the gums in their relation to the teeth. This anatomic relationship often affords rather deep incubation harbors, especially around partially erupted wisdom teeth (third molars). As a consequence, Vincent's infection frequently develops during periods of tooth eruption in adolescents and also in teething infants.

The incidence of this disease is believed by some observers to be markedly increasing, especially among adolescents and young adults. A similar unproved assertion is made in reference to the occurrence of the disease in women.

Fig. 1.—Severe case of Vincent's infection.

Fig. 2.—Gingivitis in man aged 27, from presence of calculus and infection; acute Vincent's infection. The gingival tissues are swollen, inflamed and infected. (Courtesy E. D. Coolidge.)

CAUSES

The exact identity of the causative bacteria was not established until very recently. It is now believed that four different micro-organisms working together are responsible for the bacterial phase of the disease. These bacteria grow only in an environment free of oxygen. This accounts for many important aspects of the course which the disease follows.

Small numbers of the bacteria associated with Vincent's infection of the mouth may be found in most mouths during health. They probably may be regarded as normal inhabitants of the mouth along with the many other varieties routinely observed. This indicates that certain conditions predisposing to the infection are probably of much greater importance than the presence in the mouth of small numbers of these bacteria. Axiomatically, the mere presence of bacteria in the mouth does not in itself constitute infection.

The conditions predisposing one to Vincent's infection of the mouth are numerous and varied. Some are local or oral; others are systemic. The latter may include: (1) vitamin deficiencies, (2) diseases of the blood and blood-forming organs, (3) allergies, (4) dietary and drink indiscretions, (5) certain febrile and debilitating diseases and (6) effects of certain drugs.

The predisposing factors in the disease that act locally in the mouth include all the various irritants arising from lack of hygienic care and defects of the teeth. Great emphasis is placed on the probable relationship of tobacco smoking to Vincent's infection of the mouth. The increasing incidence of this disease said to prevail among women and adolescents of both sexes and the increase in the smoking habit among them are said by many clinicians to be related. The

effects of smoking undoubtedly vary widely with the susceptibility or tolerance of individuals. However, clinical observations indicate an important relationship. The chemical irritation of the mouth tissues, with its effects on circulation, the lowered resistance and the displacement of the normal oxygen-containing air by smoke in the mouth all favor the overgrowth of the causative bacteria and enhance their ability to invade the tissues. Clinical confirmation of this relationship can be had in the increased efficiency of treatment when abstinence from smoking is required and the failure of response to treatment when the habit is continued. In the latter instance, results of treatment are often unsatisfactory and recurrences are frequent.

SYMPTOMS

The symptoms of Vincent's infection of the mouth vary widely with the intensity of the disease. The acute form is characterized by local discomfort, a characteristic foul odor, inflammation, ulceration and bleeding of the gums, excessive salivation, enlargement of the glands of the neck, general malaise, etc. These symptoms decrease in intensity as the disease subsides to chronicity. In its chronic stage, the disease presents a slow ulcerative process, which gradually destroys the gums and other structures supporting the teeth. The gums bleed readily, but other symptoms may be so mild as to escape notice by the patient.

TREATMENT

The local treatment of Vincent's infection of the mouth is distinctly a dental problem. However, medical consultation is sometimes advisable or necessary to care for the systemic conditions which may contribute to or result from the oral infection. In the treatment, certain manipulative measures designed to improve oral health, remove various irritants and open, cleanse and irrigate the incubation zones constitute the essentials of local treatment. Abstinence from smoking should be required. The value of drugs topically applied is open to question. Numerous drugs have been advocated for use, both topically and by injection, in the treatment of this disease. However, scientific tests to establish their real virtues have yet to be presented. This is true not only of drugs for chair-side use by the dentist, but also of the innumerable mouthwashes which have been proposed. In the latter instance, a warm saline (table salt) solution will serve all the useful purposes of a mouthwash. The cumulative effects of some drugs used in mouth washes are of considerable importance. This is particularly true of sodium perborate. The indiscriminate and prolonged use of this and other drugs may result in marked chemical injury to the tissues of the mouth.

THE QUESTION OF CONTAGION

Considerable debate still prevails in professional circles regarding the possibility of transmission of Vincent's infection of the mouth. The large number of cases that have been reported at various times is cited in support of this contention. However, many other facts point to the contrary. The occurrence of large numbers of cases in an army or institution may just as readily be due to the debilitating conditions under which large numbers of individuals live, a commonly prevailing dietary deficiency, etc. Under such conditions, an outbreak of the disease in considerable numbers cannot properly be called an epidemic. As a matter of fact, the transmission of this disease in man has never been scientifically demonstrated. However, patients suffering from Vincent's infection of the mouth, particularly the acute form, should be advised to exercise the simple sanitary measures usually practiced in other instances of acute oral or respiratory disease.

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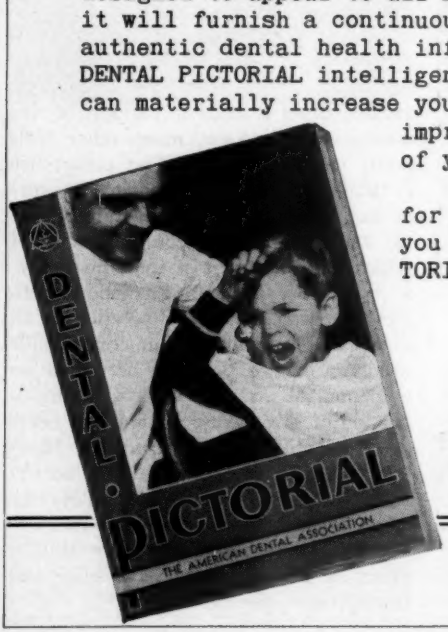

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COUNCIL ON DENTAL THERAPEUTICS

ENDOCRINES AND DENTISTRY

PART II

(Continued from April, page 603)

ISAAC SCHOUR,* D.D.S., Ph.D., D.Sc., and MAURY MASSLER,† D.D.S., M.S.,
Chicago, Ill.

THE THYROID

The thyroid gland is located in the neck. It is an H-shaped organ which embraces the outer surface of the larynx and is derived from the second and third branchial clefts. It produces a specific hormone, thyroxin. The major function of the thyroid hormone is to regulate the basal metabolic rate. Its effects upon growth and development may be secondary to those upon the rate of cellular metabolism and cellular differentiation.

Hypothyroidism.—General considerations: The effect of a deficiency in the secretion of thyroxin, the active ingredient of the thyroid hormone, is to depress markedly the basal metabolic rate or rate of cellular metabolism. As a result, growth virtually stops in almost all tissues. Certain tissues are more severely affected than others, the degree depending on the rate of growth at the time of disturbance.

Three types of hypothyroidism have been recognized on the basis of the time of their effect. Hypothyroidism occurring at birth and during the period of most rapid growth results in the condition known as cretinism. (Fig. 12.) Hypothyroidism occurring between 6 and 12 years, when growth is slower, but still is important, is known as juvenile myxedema. After puberty, when growth is no longer an important factor, hypothyroidism results in adult myxedema, in which the effects on growth are relatively slight, since growth activity has normally slowed down. (Fig. 12.)

In cretinism, severe and striking effects of hypothyroidism are seen in understature and disproportion. Bone growth is almost completely arrested, while the soft tissue is profoundly, but relatively less affected. The dwarf is, as a result, generally obese.

Since cretinism occurs during the first year of life, when the growth of the brain is most rapid, mental development is markedly deficient. These effects are in contrast to those shown in pituitary dwarfism, in which the affected person is symmetrically proportioned and mentally alert.

Craniofacial development: The facies of the cretin is quite striking, inasmuch as the cranium appears disproportionately large. The face is infantile and coarse, the expression stupid. The denture is prominent and the nasal area appears sunken as a result. (Fig. 13.) The paranasal sinuses are markedly retarded in development.

Growth of the jaws: The bases of the jaws are small as a result of a general arrest of bone growth. However, the presence of the teeth, which are less severely affected than the jaws, and their partial eruption result in an alveolar process and denture which, although diminished in size and crowded, appear to be large only in proportion to the size of the jaw bases. The result is a protrusion and disproportionate size of the denture, which displaces the mandibular base downward and backward. A cretin of the chronologic age of 20, but a bone age of 3 years, may have a dentitional age of 8. The effect is thus of an 8-year-old denture placed in a 3-year-old skull. (Fig. 13.) Engel *et al.* give a detailed analysis of the cephalometric findings in hypothyroid patients.

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After the publication of the last (June) installment, the complete article by Dr. Isaac Schour and Dr. Maury Massler will be available in pamphlet form at nominal cost.

Growth of the teeth: The enamel, dentin and cementum appear to be normal in structure and form, but retarded in development. The delay in formation of the dentin is indicated by the incompletely developed roots and open pulp canals observed in the roentgenogram. As mentioned above, the effect upon the growth of the teeth is much less than upon the growth of the bony jaw base and alveolar process or upon eruption.

Eruption: Eruption of the teeth is markedly retarded and the shedding of the deciduous teeth is delayed, so that occasionally two rows of anterior teeth are present, the deciduous and the permanent. Nevertheless, eruption is less retarded than bone growth.

Differences in effects of hypothyroidism and hypopituitarism: The retardation in skeletal development is more severe in hypothyroidism than in hypopituitarism. In the latter, however, retardation of dentin growth and tooth eruption is less than that of bone growth, and as a result, the denture is too large for the facial skeleton and jaw bones. In hypopituitarism, the retardation in tooth growth and eruption follows more

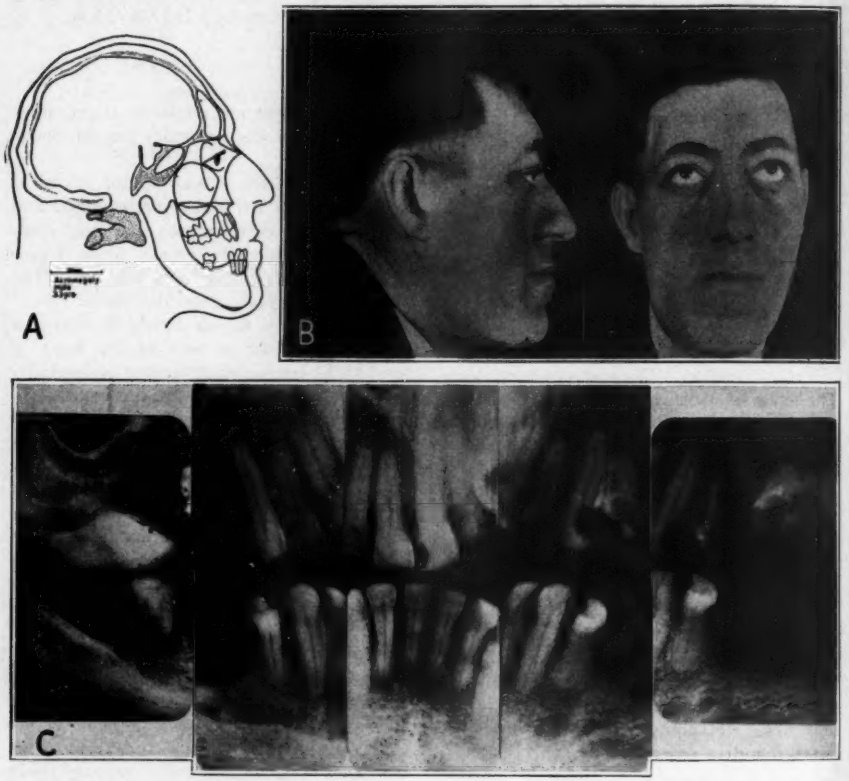


Fig. 11.—Findings in 33-year-old acromegalic, male. The onset of the disease was noted at the age of 25 years, when the subject was 6 feet 2 inches tall and weighed 180 pounds. The present height is 6 feet 2 inches; weight, 204 pounds. A, tracing of cephalometric headplate. The enlargement of the sinuses, overgrowth of the facial skeleton, mandibular prognathism and spacing of the teeth are to be noted. B, lateral and frontal photographs. C, intra-oral roentgenograms showing marked supra-eruption of teeth and resorption of roots. (Case obtained through courtesy of Department of Medicine, University of Illinois.)

nearly that of the bony growth, with greater resultant harmony between denture and bony base. (Figs. 3 and 4.)

Incidence of caries: Kranz's view (1914) that the incidence of caries is high among cretins has not been substantiated. Thoma points out that Kranz's controls also showed an unusual number of carious teeth. In our experience, caries was associated with poor oral hygiene rather than with the endocrine condition. Taylor and Appleton report no increased incidence of caries in the cretin.

Parodontosis (periodontosis) in myxedema has been described. (Becks, Lewis.) However, juvenile and adult myxedema are no longer serious clinical problems. The treatment with thyroid is relatively simple.

Experimental hypothyroidism: The effects of experimental thyroidectomy are not well understood because this operation (in the rat) usually includes the removal of the parathyroid glands. Todd and Wharton found delayed eruption and defective jaw growth in sheep that were thyroidectomized soon after birth.

Thyroid therapy: The successful preparation of concentrated thyroid extract and the isolation of thyroxin have made the treatment of hypothyroidism spectacularly successful. Unfortunately, this has led to the unwarranted application of thyroid therapy to other conditions on the basis of their superficial resemblance to hypothyroidism. Thus, thyroid extracts have been used indiscriminately in the treatment of obesity due to overeating and underexercise; mongolism, gargoylism, etc., often for lack of other known treatment. The administration of thyroid extracts to accelerate the eruption of the teeth of infants is not justified, since deleterious changes in the blood vascular system (heart and arteries) have been noted. (Kendall.)

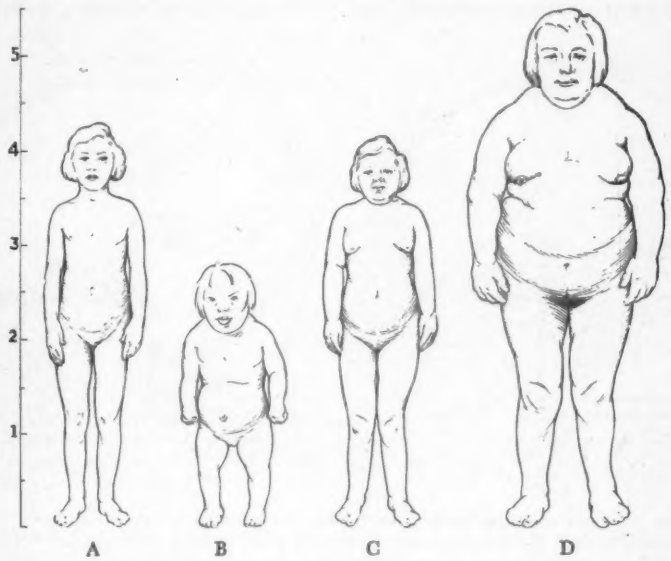


Fig. 12.—Composite drawings illustrating different effects of hypothyroidism in females at different ages. A, normality; B, cretinism; C, juvenile myxedema, and D, adult myxedema. (Composite drawings from figures in Wolf's "Endocrinology," Thoma's "Oral Pathology," Zondek's "Diseases of Endocrine Glands" and photographs of patients.) In A, the chronologic age is 10 years; height, 4 feet 4 inches. In B, the chronologic age is 10 years; height, 2 feet 10 inches. In C, the chronologic age is 10 years; height, 4 feet 1 inch. In D, the chronologic age is 35 years; height, 5 feet 5 inches.

Hyperthyroidism. — Hyperthyroidism in

children is relatively rare and brief, since diagnosis and treatment (surgical removal) are not difficult. The increase in basal metabolic rate (above 60) is pathognomonic, as are the increase in temperature, perspiration and nervous irritability and the characteristic wide-eyed, staring exophthalmus. (Fig. 14.) Increase in growth and in development have been reported. Welti reports hyperthyroidism in a child aged 5 with a bone age of 10-12 years. The deciduous teeth had begun to be shed at 3½ years and the dentition at the time was that of a 9-year-old child. This is in contrast to the effects seen in hypothyroidism.

Parodontosis (periodontosis) has been said to be associated with hyperthyroidism, but this statement has not been substantiated in the few cases in children seen by us.

Experimental hyperthyroidism: The effect of experimental hyperthyroidism is to raise the basal metabolic rate, which, in turn, causes an increase in rate of cellular differentiation, loss of weight, rapid heartbeat, flushing and increased nitrogen excretion. The effect on skeletal development has not been sufficiently investigated.

Injection of thyroxin in new-born rats results in a precocious eruption of the incisor (Karnofsky and Cronkite). In older rats, eruption of the continuously erupting incisors is accelerated. (Herzberg and Schour.) Formation of enamel is accelerated, but its structure is not modified. (Hoskins.)

Thoma reports marked resorption (osteoporosis) of the spongiosa, without repair, in jaws of guinea-pigs fed large amounts of thyroxin. The marrow spaces are markedly enlarged and the width of the periodontal membrane is increased, a true parodontosis resulting. Pulpal inclusions occur during the growth of the dentin, the pulp being hyperemic and fibrotic.

PART II

THE GONADS

Function.—The gonads (ovaries and testes) serve both an exocrine (the elaboration of the ovum or the sperm) and endocrine function. The endocrine function is concerned with the secretion of hormones that control the growth and development of the sex organs and the secondary sex characters both physical and psychic.

Normally, with the onset of puberty (presumably initiated by the secretion of gonadal hormones), the period of active growth is ended and the maturation processes follow, such as closure of the epiphyseal growth sites and change in the voice. The gonadal

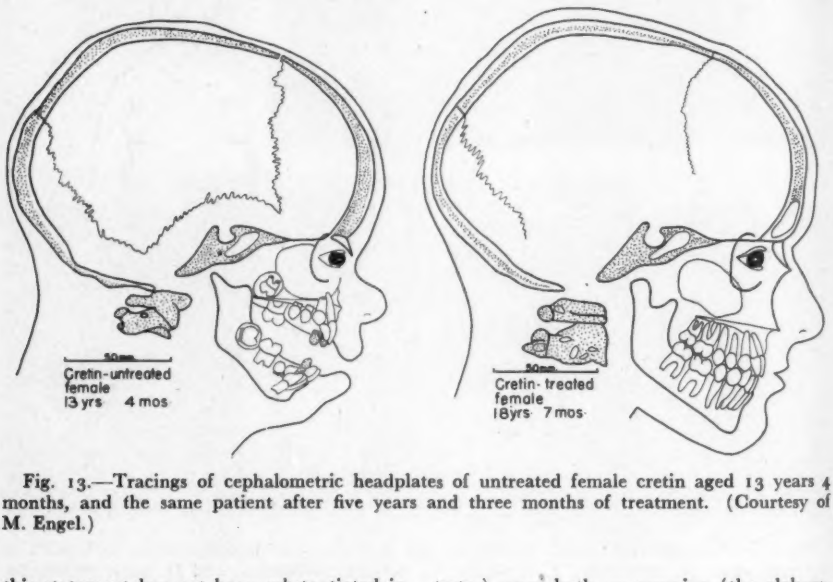


Fig. 13.—Tracings of cephalometric headplates of untreated female cretin aged 13 years 4 months, and the same patient after five years and three months of treatment. (Courtesy of M. Engel.)

hormones thus limit the length of time of active growth, act as growth inhibitors and initiate sexual maturation.

Hypogonadism.—General considerations: Since the androgens bring to an end the period of active growth and initiate maturation, a deficiency in the secretion of the gonadal hormones before puberty results in immaturity, a prolongation of the growth period and failure of the epiphyses to close. The end-result is the typical eunuchoid type of gigantism.

The delay in maturation is evidenced by delay in the appearance of the secondary sex characteristics and in failure of the epiphyseal growth sites to close (sometimes up to as late as 40 years). The musculature remains underdeveloped, but growth in length of the limbs, fingers and toes continues beyond the normal time and a disproportionate elongation results, with sexual immaturity and a childlike facies. (Fig. 15.)

Fig. 14.—Drawing showing wide-eyed, staring facies characteristic of exophthalmic goiter, in a child, female, and in woman. (Redrawn from Thoma's "Oral Pathology," and Timme.)

The eunuchoid giant exceeds the normal in stature, but is disproportionate inasmuch as the limbs are very long. (Fig. 15.) The lower measurement exceeds the upper and the span is equal to or exceeds the height. The fingers and toes are long and tapering. There is marked underdevelopment of the musculature, with underweight, in contrast to the obesity seen in adult hypogonadism. (Fig. 15.)

Since castration is no longer practiced, hypogonadism is rarely found in the very young. It is doubtful whether there are any effects upon the teeth and there are none if hypogonadism begins after the sixth year. In the adult, once the epiphyses are closed, hypogonadism causes no skeletal changes. However, there is a regression of the secondary sex characteristics, with obesity and nervous and psychic upsets. (Fig. 15.)

Primary and secondary hypogonadism: Primary hypogonadism may occur as a result of castration or degeneration of the testes as in tuberculosis. If it occurs before puberty, the result is the eunuchoidism and non-adipose gigantism. (Fig. 15.) In the adult, the result is obesity, with normal height. (Fig. 15.)

Secondary hypogonadism results from failure of secretion of the gonadotropic hormone of the anterior pituitary gland during the prepuberal period, and the affected person is understatured (probably as a result of a concomitant deficiency in the pituitary growth hormone) and obese, with underdeveloped genitalia (Fröhlich's syndrome).

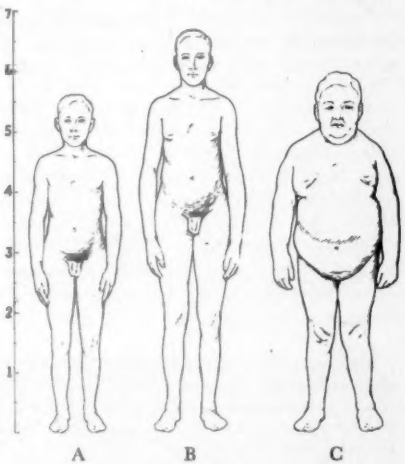


Fig. 15.—Composite drawings showing effects of hypogonadism at different ages. A, normality; B, juvenile hypogonadism; C, adult hypogonadism. (Drawn from figures in Timme's and Zondek's texts and from photographs of patients.) In A, the age is 16 years; height, 5 feet 7 inches. In B, the age is 16 years; height, 6 feet 8 inches. In C, the height is 5 feet 10 inches.

Growth effects of the pituitary growth hormone and gonadal hormone activity: The pituitary growth hormone acts to accelerate the rate of somatic growth. On the other

hand, the gonadal and gonadotropic hormones, by initiating maturation, serve to limit the time of active growth. The action of the gonadal hormones is therefore that of growth regulators and inhibits the action of the pituitary growth hormone. The mechanism of action differs in the two. The pituitary growth hormone acts upon the rate, while the gonadal hormones regulate the duration of growth. A balance of the two effects is essential to normal growth and development.

Craniofacial development: The facies of the eunuchoid giant is childlike in its proportions, but oversized. The craniofacial proportions are characteristic of his chronologic age, but the rest of the body is tall and gangling. (Fig. 15.)

Growth of the jaws: There appears to be an increased amount of bone formation. As a result, the jaws tend to become massive

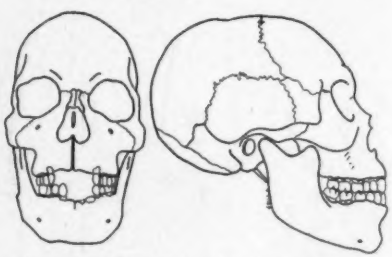


Fig. 16.—Frontal and lateral aspects of skull of castrate (redrawn from Tandler and Grosz); showing overgrowth of facial skeleton and massive jaw. The frontal sinus and glabella are overdeveloped.

and the ramus appears short. (Tandler and Gross; Kranz.) (Fig. 16.) The paranasal sinuses appear to be increased in size. The increase in the rate of bone formation, however, appears to be much less than that in hyperpituitarism. In hypogonadism, there is thus more bone formation than is normal, but not the dysplastic effects of acromegaly.

The growth and calcification of the enamel and dentin and the eruption of the teeth appear to be normal. In some cases, the eruption of the teeth seems more advanced than usual, but cannot be said to be abnormal.

Experimental hypogonadism: The changes in the teeth and jaws after gonadectomy have in the rat been negative. Kranz reports the

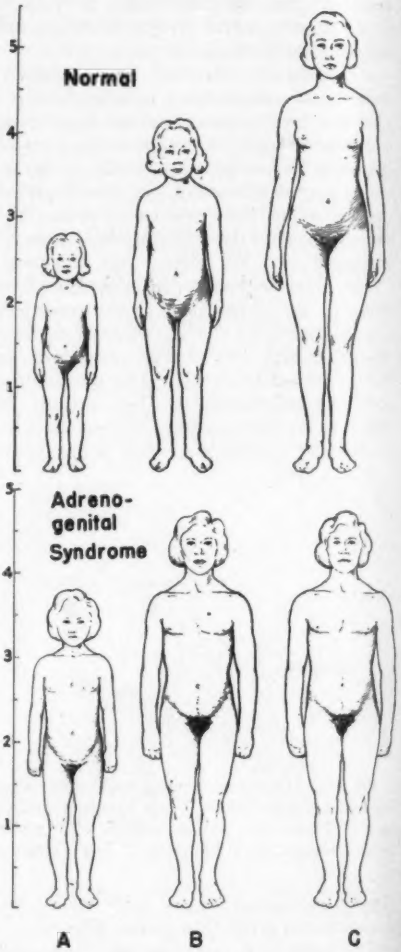


Fig. 17.—Composite drawings showing (above) a normal girl at 3, 8 and 15 years of age and (below) composite drawings (to same scale) of effects of hypergonadism at an early age. Similar effects are seen in the adrenogenital syndrome, macrogenitosomia praecox, precocious puberty and pseudohermaphrodism. Growth and maturation are markedly accelerated, but growth stops early (about 7-8 years). (Adapted from figures in Wolf's "Endocrinology," Thoma's "Oral Pathology" and photographs supplied by I. P. Bronstein.)

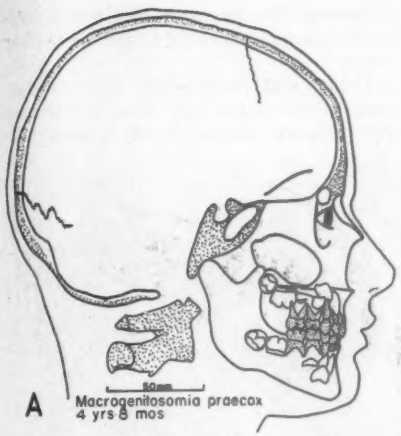


Fig. 18.—A, tracing from cephalometric roentgenogram of pseudohermaphrodite, chronologic age 4 years 8 months. The same effects are obtained in precocious puberty, the adrenogenital syndrome and macrogenitosomia praecox. The carpal age was 10 to 11 years. The craniofacial skeleton corresponds to that of a 10-year-old child. The eruption of the teeth corresponds to that of a 5-year-old child, while the dentin age is 6 years. Dentition is therefore not so markedly affected as is growth of bone. The lower permanent second bicuspids were congenitally missing. (Courtesy of I. P. Bronstein.)

tion of the growing enamel, dentin and bone. (Schour.)

Therapy: Hypogonadism and its clinical manifestations (undescended testes, amenorrhea, etc.) are improved by injections of the gonadotropic hormones, concentrated extracts of which are available. These extracts have also been used, with indifferent results to limit growth in cases of overgrowth due to various conditions.

Hypergonadism.—Increased secretion of the gonadal hormones may be caused by adrenal tumors (adrenogenital syndrome) or midbrain tumors. The result in children can be seen as hypergenitalism, precocious puberty (pubertas praecox) and a tremendous acceleration in somatic growth (skeletal, muscular and visceral) (macrogenitosomia praecox). The increase in secretion of gonadal hormones at an early age causes the acceleration of all maturation processes, and their early appearance. At the same time, there is a tremendous acceleration of growth, as if the growth potential, having to be expressed within a short time, must do so at an increased rate. The secondary sex characteristics appear early, and with them all the changes incidental to puberty. The ossification centers also appear very early, and the rate of skeletal and somatic growth is markedly accelerated. For example, a 3-year-old

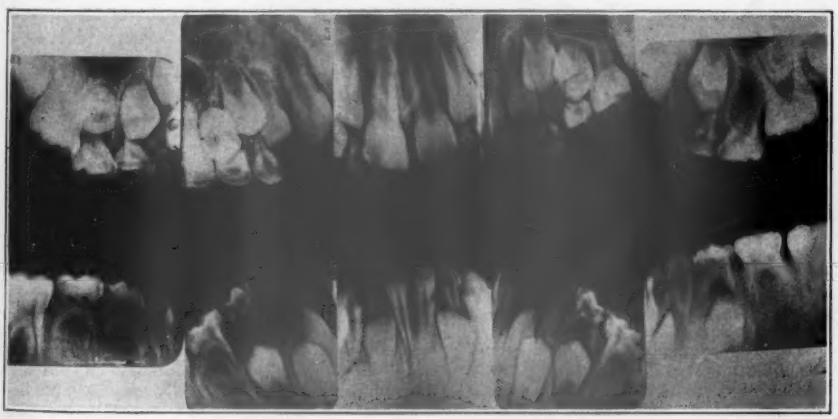


Fig. 18. (cont.)—Intra-oral x-ray films of patient shown in Figure 18, above. The lower permanent second bicuspids are congenitally missing.

retarded eruption of cuspids of castrated pigs.

Gonadectomy in the thirteen-lined ground-squirrel results in disturbances in calcifica-

girl shows pubic and axillary hair, menstruates regularly and has the skeletal development and carpal centers of a 9-year-old

child. (Figs. 17 and 18.) (In the male, the penis is enlarged and motile spermatozoa are found.) At an early age, usually 6 to 7 chronologic years, the precocious child actually is understatured and undersized, with characteristically short, powerful limbs.

of a sturdy, strong man. The female looks very masculine (Fig. 17) and has a deep voice.

Craniofacial development: The development of the cranial and facial skeleton and the paranasal sinuses follows in general the

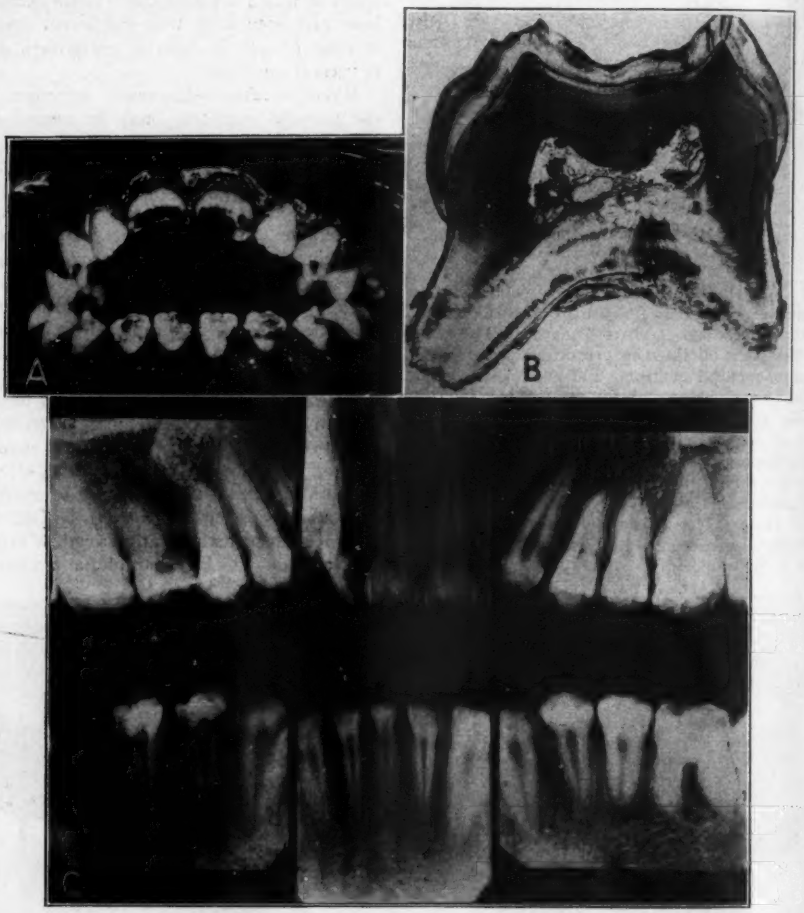


Fig. 19.—Hypoplasia and open bite in parathyroprivic tetany. (Courtesy of H. G. Poncher.) A, clinical appearance of teeth; showing typical chronic hypoplasia of infancy. B, histologic section of deciduous molar; showing disturbed calcification of enamel and dentin forming during infancy. C, intra-oral roentgenograms of patient; showing peculiar trabeculation of bone, beginning resorption of roots of lower anterior teeth and resorption of alveolar bone around upper anterior teeth and lower right bicuspids.

In hypergonadism, the muscular development is very good and hirsutism is prominent, giving the individual the appearance

growth of the rest of the skeletal system. The size and proportions are in harmony with the body size and proportions. The

size of the jaws appears to be in harmony with the rest of the craniofacial skeleton. (Fig. 18.)

Growth of enamel and dentin and eruption of the teeth: The apposition of enamel and dentin and the eruption are accelerated but not to the same degree as is skeletal growth. A 3-year-old child with a skeletal age of 10 years shows the teeth and denture of a 4-year-old. Peculiarly enough, tooth development (formation of enamel and dentin and eruption) is much less affected than is skeletal development. This is in contrast to pituitary gigantism, wherein eruption is markedly accelerated. (Rushton; McCullagh and Resch.)

Experimental hypergonadism: Ziskin (1941) studied the effects of injection of female (estrogen and progesterone) and male (testosterone) gonadal hormones upon the gingivae and oral mucosa in rhesus monkeys and in man. He found that injection of the gonadal hormones stimulates the gingivae

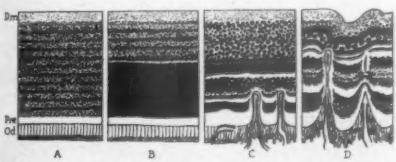


Fig. 20.—Effects of parathyroidectomy on developing dentin of rat incisor (Schour, Chandler and Tweedy). A, normal dentin. D, most severe effects of parathyroidectomy.

and oral mucosa, causing a marked hyperkeratinization of the epithelium and hyperplasia of the connective tissue. The effects on skeletal and dental development were not studied.

The effects of injection of the estrogens on the growth of bone in mice have been studied. Injection of estrogens in immature mice (male and female) causes a marked proliferation of new bone, filling in the medullary cavities of the long bones, and a sclerosis. Growth in length is, however, inhibited and the pubic bones show resorption. (Kendall.)

The periods of physiologic change in hormonal balance: Puberty, menstruation and pregnancy constitute periods of hormonal change during the normal life span.

Puberty: Puberty represents a period of maturation accompanied by profound physical and psychic changes. At the same time the hormonal constitution, and therefore the internal economy, undergo a marked readjustment. As a result, changes in the body tissues are inevitable. Subclinical anemia has been described, acne, anorexia and changes in body contour (loss of prepuberal roundness or obesity; appearance of the secondary sex characteristics). The dentist is confronted with problems of an increase in the incidence of caries, gingivitis and even acute alveolar atrophy during this period of life. These problems, however, have never been clearly stated or adequately investigated.

The menstrual cycle: The menstrual period and its relation to systemic and dental health is another problem that should be investi-

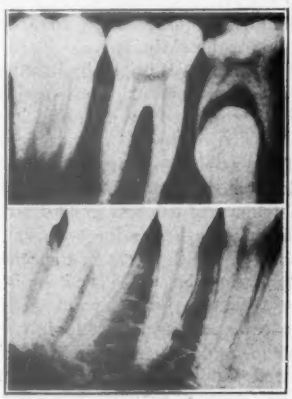


Fig. 21.—Intra-oral roentgenograms showing effects of hyperparathyroidism on alveolar bone. The bone has a ground-glass appearance. The fully formed teeth are unaffected. (From Strock.)

gated further. The characteristic subclinical anemia evidenced in pale gingivae and oral mucosa may have important bearings on the problem of periodontal disease. Biedl (1931) reports frequent gingivitis and periodontal disturbances in women as well as a "gingivitis dysmenorrhea" and a "gingivitis gravidum." (Thoma.)

The menopause brings with it profound upsets both physiologic and psychic. The influence upon tissue maintenance and health is still not well understood although there are indications that tissues "age" markedly

during this period. A synthetic estrogenic substance, stilbestrol, has recently been used with marked success in the alleviation of the metabolic and psychic symptoms. (Kendall.)

PREGNANCY

Pregnancy involves profound hormonal changes and the associated problems of metabolism and diet have been well recognized and extensively studied. It is a period of physiologic, metabolic and psychic strain. However, a number of the misconceptions concerning the relation of pregnancy to the teeth warrant correction at this time.

A current popular though incorrect saying used frequently and uncritically by both the medical and dental professions is: "A tooth for every child." In the face of evidence to the contrary, this saying has been strengthened through unquestioning reiterations and has led to irrational therapy.

The aphorism was originally based upon a number of erroneous concepts, which have since been corrected by scientific investigation. The first of these is that calcium withdrawal is possible from the teeth just as it is possible from the bones. Since the bone acts as a storehouse of calcium to be drawn upon when the need arises in the organism, many men have placed the teeth in the same category, forgetting that while the bone is a vital cellular structure, both enamel and dentin are avascular and acellular. In fact, enamel is a dead structure not even having encapsulated within its substance protoplasmic processes (dentinal tubules) as does the dentin. Calcium withdrawal from the bone is made possible not through any mysterious process of decalcification, but by the process of resorption by osteoclasis. For this process to operate, the tissue must be vascular and cells must be in close approximation to it. These conditions obtain only to a very limited degree in the dentin and are absent in the enamel. In fact, physiologic resorption occurs only in the deciduous teeth. The fundamental differences between bone and teeth are completely disregarded in the concept that calcium withdrawal from the teeth is possible. There is no evidence to support this assumption nor any scientific mechanism to explain it.

The second misconception upon which the saying is based is that caries is related to calcium metabolism. The mechanism of this relationship is not made clear by any adherents of this theory and none has been established. Bacterial action contributes to dental caries, which begins at the surface of the tooth and is certainly not caused by an internal withdrawal of calcium from the teeth.

The calcium needs of the mother are increased during pregnancy and, as a result, the blood calcium level is usually somewhat low. (Bodansky.) The fetus is a parasite which lives upon the mother and obtains its nourishment directly through the blood stream, regardless of whether its dietary elements are ingested by the mother or taken from the mother's tissues. However, the total amount needed by the fetus is

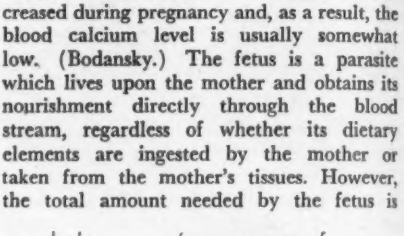


Fig. 22.—A, effect of experimental hyperparathyroidism on serum calcium and calcification of developing dentin of incisor of rat. B, histologic sections showing effect of parathormone injections on developing dentin in incisor of rat.

relatively small in relation to the total body calcium of the mother. As a matter of fact, the iron needs of the 7 to 9 months old fetus and of the mother are often more important than the calcium needs.

The body of the full-term infant weighing 3,000 gm. contains approximately 24 gm. of calcium. The average woman has from 2,000 to 2,500 gm. of calcium, of which 97-

98 per cent is within the bones and less than 1 per cent in the teeth. The total calcium need of the fetus is therefore 1 per cent of the mother's store. Such a drain is not serious. However, for the safety of the general health of both mother and infant, it is essential that the calcium intake of the pregnant woman be established at a minimum of 1.5 gm. per day.

Under various conditions, from 10 to 40 per cent of the calcium is retained, so that, during the last five months of pregnancy, the mother retains at least the amount of calcium needed by the fetus. Usually, an excess is retained and stored in the maternal reserves. There is no reason to believe that the needs for fetal calcium must, except under extraordinarily severe dietary restrictions, be obtained from the maternal reserves in the skeleton. However, since the alveolar bone, which supports the teeth, is the most viable of bone, it is possible that the alveolar bone might suffer first when calcium must be obtained from the osseous structures because of failure to absorb it by way of the gastro-intestinal tract. Intra-oral x-ray films of pregnant women do not support the thesis that bone destruction is common during pregnancy. As a matter of fact, the literature does not contain any evidence that alveolar bone destruction is more common during pregnancy than at other times.

The relationship between pregnancy and caries has often been pointed out by both physician and dentist to the expectant mother. As a result, she has come to expect the loss of a tooth or many teeth as an additional sacrifice which she must bear for her unborn child. Clinical investigations reveal the fact that caries is no more prevalent in pregnant than in non-pregnant women of the same age. (Ziskin.) This does not mean that caries does not occur in pregnant women. When caries does occur to any degree during pregnancy, it can almost always be related to poor daily care of the mouth associated with the presence of sordes and acid metabolites from the nausea and vomiting of pregnancy.

Gingival involvement does occur in a relatively mild form (pregnancy gingivitis) during pregnancy, in about 50 per cent of cases (Schmidt), being due either to the above-mentioned local conditions or to the temporary endocrine imbalance. (Ziskin, Blackberg and Stout.) This gingival condition is neither serious nor difficult to eradicate, and normally disappears after childbirth. It must be remembered that a similar gingivitis occurs in about 20 per cent of non-pregnant women. As a matter of fact, the existence of a specific gingivitis due primarily to pregnancy (gingivitis gravidum) should be seriously questioned. So-called pregnancy gingivitis is usually associated with mild systemic disturbances and oral neglect during pregnancy and does not occur in pregnant women with good systemic health and adequate oral hygiene. (Cahn.)

While periodontal disease, especially alveolar atrophy, is theoretically possible during pregnancy, it is actually rarely associated primarily with pregnancy and then only when other and more direct etiologic factors in periodontal disease are present. The vague and uncritical use of "disturbed calcium metabolism" should not be invoked to "prove" any such hypothetical relationship.

There is no question that the pregnant woman should have dental care, but there is no reason to believe that she will nonetheless suffer unduly from dental disease as a result of her pregnancy. The incidence of caries and periodontal disease during pregnancy is not greater or less than the normal. The statement "A tooth for every child" is a dental myth.

RESEARCH COMMISSION

NATIONAL BUREAU OF STANDARDS AND THE RESEARCH COMMISSION

THE cooperative research project between the American Dental Association and the National Bureau of Standards has been in progress for the past fifteen years. This work has been very beneficial to the profession and has placed the Association in a most enviable position internationally.

Early in 1942, military researches at the Bureau made increased demands for personnel with specialized training. During the summer, the Executive Board of the Research Commission made an inquiry regarding the status of the dental program. Representatives of the Bureau assured us that our program would not be curtailed. Further inquiry did reveal, however, that the Bureau was having difficulty in recruiting personnel properly equipped to conduct its military researches for the Army, Navy and other branches of the service.

In October, the Executive Board decided to extend an offer to lend its research associates if their services could be of assistance in the war efforts. The director of the Bureau was greatly impressed and most appreciative of the offer, but was reluctant to do anything that would seriously curtail the dental program especially since the dental group had lost the services of Dr. George C. Paffenbarger, who was called by the Navy in January 1942, and of Mr. W. T. Sweeney, who resigned to accept a position as director of research for one of the dental manufacturing companies. The Executive Board assured Dr. Briggs, Bureau Director, that the American Dental Association would consider it a distinct honor if he were to take advantage of this offer at an early date.

Since that time, the Bureau has been designated a "Prohibited Military Zone" and is engaged 100 per cent in war work.

Acting on our offer, the Bureau advised us that Mr. H. J. Caul has been transferred temporarily to a confidential project for the War Department in the Metal and Ore Analysis Section of the Chemistry Division. In addition, an engineering problem has arisen in one of the Bureau's secret researches for the Navy on which Mr. J. R. Beall is particularly well equipped to work. Naturally, we gave our approval to the transfer of these men. It is the belief of the Executive Board that advantages will accrue to the Association from this loan of its personnel beyond the aid rendered the government in its war efforts, in that the training and information acquired by our men will be most useful when they return to our regular program.

It is understood that these changes are of a temporary nature and will not close the dental research program. However, it is obvious that the work must be curtailed for the duration. Only those problems of an emergency nature can be accepted for the immediate future.

The cordial and fruitful relations which exist between the National Bureau of Standards and our Association are in a large measure reflected in the personal interest of the Bureau's director, Dr. Lyman J. Briggs, in the dental research program. The Research Commission takes this opportunity to state publically, to him and to his associates, Mr. Bearce and Dr. Souder, the appreciation of dentistry and, through dentistry, the appreciation of the public of their efforts and to express the hope that the day will soon arrive when this work in which we have made such excellent progress will be resumed under the ideal conditions in which it has been carried on in the past.

DANIEL F. LYNCH, *Secretary*
M. D. HUFF, *Chairman*

Washington, D. C. April 1, 1943

PAN AMERICAN RELATIONS COMMITTEE

SECOND REPORT OF THE COMMITTEE

IN the first report of this committee, submitted at the St. Louis meeting last August, detailed steps of our program and plans were enumerated. Since that time, much progress has been made with regard to these plans. In some fields of endeavor, there has been greater progress than in others, but, in general, the whole program of the Association in regard to the other American republics is moving along at a healthy and steady pace.

As the committee's work progresses, the importance of it becomes more significant. It is generally felt by the committee members that the Pan American Relations Committee should be a standing committee of the Association. The chairman has talked this matter over with the Secretary of the Association and has been advised to present the motion to the Committee on Constitutional and Administrative By-Laws. This has been done, and it is hoped that the motion will be acted upon favorably.

The arrangement for Pan American membership has proved to be popular, and already we have twenty-five paid memberships. All of the dental societies in Latin America have not been officially notified of this plan, but it is the intention of the chairman to see that such notification is given them in the near future.

Since most of the mail to the other American republics must go by air, at the present time, it is not possible to write so frequently as is desirable, since the cost is prohibitive. However, the chairman has made it a practice to send periodical notices and, at such times, as many miscellaneous data as possible are included, for the information of our Latin American colleagues.

The dental journals from Latin America that are in our library are receiving special attention at this time. Most of the important ones are bound and are available for use by our members. However, there are several others that should be represented and exchanges with all of the missing dental publications are now being arranged by our librarian, Mrs. Hunt. The chairman would like to call attention to the excellent work of Mrs. Hunt and the wholehearted cooperation that she has always given and is now giving this committee. We are deeply grateful because we believe that an efficient exchange of dental journals is one of the best ways to keep in contact with the work of our colleagues in Latin America.

During the month of November, a special committee composed of Cecil C. Connelly, chairman of the A.D.A. Motion Picture Committee, Lon W. Morrey, chairman of the Bureau of Public Relations, Stanley D. Tylman, a member of the Pan American Relations Committee, and Daniel F. Lynch, chairman of the Pan American Relations Committee, met with Mr. Mervin LaRue, a technical advisor on motion pictures, suggested by the Office of Coordinator of Inter-American Affairs, in Chicago, for two days to review a selected group of thirty motion pictures. The eleven best pictures were selected for showing and distribution to the dental societies of Latin America.

The American Dental Association has been granted $10,000 by the Coordinator of Inter-American Affairs for its work with motion pictures. The chairman of the Pan American Relations Committee has asked the President of the Association to appoint a special committee to handle this work, to be composed of Drs. Connelly, Morrey, Tylman and Lynch, together with Don J. Aubertine, member of the Pan American Relations Committee. The efficient and cooperative support of Lon W. Morrey in the project is greatly appreciated by the members of the Pan American Relations Committee.

Previously to the formation of the Pan American Relations Committee, not one dentist from the other American republics had been awarded one of the scholarships granted yearly by the United States Government for postgraduate study in this country, under the provisions of the Convention for the Promotion of Inter-American Cultural Relations (Buenos Aires, 1936). However, as a result of the activities of this committee in publicizing the convention, there are now three such dentists studying in this country under the provisions of that treaty.

Nine other Latin American dental students have received grants from various sources, such as government agencies, individual schools, scientific foundations and the Pan American Odontological Association.

Preliminary plans are under way to bring at least one dentist from each of the Latin American countries to the United States for six months for postgraduate instruction in one of the leading dental schools of the Midwest. This project will be worked out jointly by the Kellogg Foundation and the Division of Cultural Relations of the Department of State, with the cooperation of the Pan American Relations Committee of the American Dental Association. It is believed that this program will be decidedly worth while, and that it may set a pattern for similar projects at other universities. It is hoped that we shall be able to report the project completed by the time of the next annual meeting, at which time the entire plan of procedure will be explained to the Board of Trustees.

The Coordinator of Inter-American Affairs Office is considering the publication in Spanish of a North American medical journal. It is hoped that the same office will give favorable attention to the publication of a North American dental journal in Spanish. The chairman of the committee is in correspondence with the Office of the Coordinator on the subject, but is not in a position to report progress at this time.

Stanley P. Tylman, professor of prosthesis at the University of Illinois, made a successful tour during the months of September and October, visiting many of the South American countries. He lectured before the dental societies and schools of Panama, Colombia, Peru, Chile, Argentina, Uruguay and Brazil. Dr. Tylman represented the American Dental Association officially at the IX Jornadas of the Asociación Odontológica Argentina, held in Buenos Aires in October. He also gave postgraduate courses to the members of the American Dental Society of the Argentine Republic. Dr. Tylman's trip was the result of an invitation extended to him by the American Dental Society of the Argentine Republic through the chairman of the Pan American Relations Committee of the American Dental Association. The Division of Cultural Relations of the Department of State assisted greatly in making Dr. Tylman's trip a success, by notifying our ambassadors in advance, in each country visited. Dr. Tylman was hospitably received in all the countries visited and he made a favorable and lasting impression for scientific American dentistry.

It is important that only men of the caliber of Dr. Tylman be sent to Latin America to hold clinics, since all American dentistry is on review whenever a dentist from the United States lectures or gives clinics in any of the countries of Latin America.

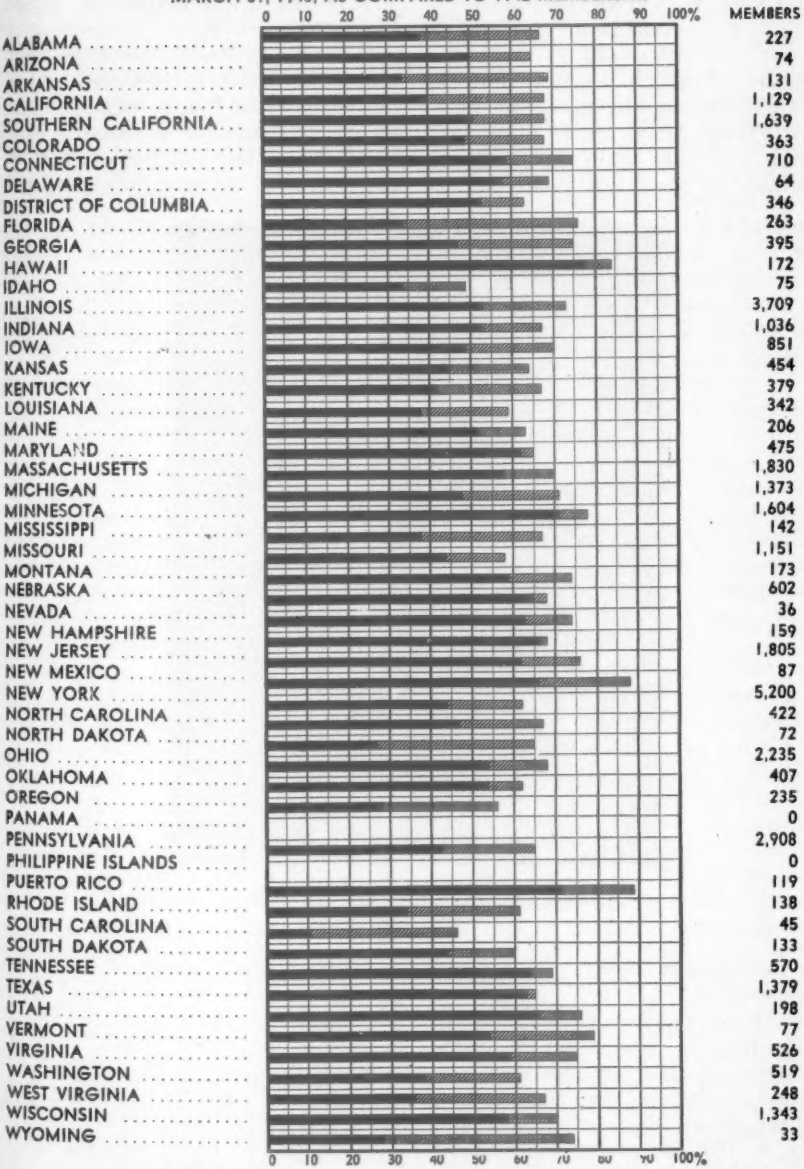
The first week in March 1943, the Fourth Medico-Dental Convention took place in Mexico City. This Congress was inaugurated some years ago by Spencer R. Atkinson, of Pasadena, Calif., a member of this committee. The congress is sponsored by the Association Mexicana de Ortodoncia. These meetings have grown to international proportions and they are considered the most significant dental meetings now held in Mexico. All dentists from the United States invited to participate in the meetings pay their own expenses to Mexico, but they are entertained royally by our Mexican colleagues during the meeting. This year, the United States Government sent the President of the American Dental Association, J. Ben Robinson, to Mexico City for the meeting.

The new national dental association of Mexico under the able leadership of its first president, Luis Farill, has accomplished great things in a short space of time. The chairman of the Pan American Relations Committee is gratified to think that the American Dental Association has aided in encouraging this new organization. The chairman accompanied Dr. Robinson to Mexico City in March for the first meeting of the new Association. Although there are other national dental societies in Mexico the membership of each is confined mostly to localized areas. The new Asociación Dental Mexicana promises to achieve a national representation that will promote the exchange of dental knowledge between Mexico and the United States. It is essential that each of the Latin American countries have a well-established and officially recognized national dental association, in order that an exchange of dental knowledge and official communications throughout the hemisphere may be assured.

Respectfully submitted,
DANIEL F. LYNCH, *Chairman.*

Membership Page

PERCENTAGE OF DUES RECEIVED IN CENTRAL OFFICE AS OF MARCH 31, 1943, AS COMPARED TO 1942 MEMBERSHIP



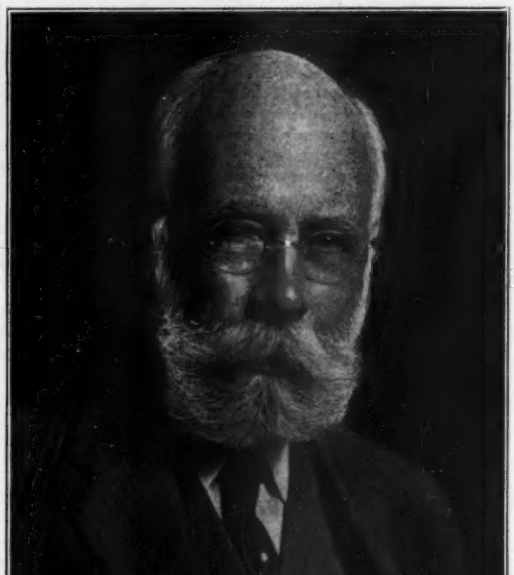
Percentage based on dental population figures supplied by the State Society Secretaries.

1943 percentage 1942 percentage

OBITUARY

HENRY WEBSTER GILLETT, D.M.D.
1861-1943

HENRY WEBSTER GILLETT died at Harkness Pavilion, Medical Center, New York, Friday, March 12, in his eighty-second year, his death following an operation. So passes into history one of the distinguished figures in contemporary dentistry.



HENRY WEBSTER GILLETT, D.M.D.
1861-1943

Dr. Gillett was born in Marlborough, N. H., June 16, 1861, of Scotch-American parentage. His early education was received at the Dedham High School, Dedham, Mass,, which he attended until 1880. In 1883, he entered the Harvard Dental School, graduating with the degree of D. M. D. in 1885.

He began private practice on Touro Street, Newport, R. I., in association with Charles A. Brackett, who was then professor of dental pathology in Harvard University. From 1891 to 1896, Dr. Gillett was an instructor in operative dentistry at the Harvard School. During that period, he did much to develop the use of cataphoresis for desensitizing dentin. He became active in several New England dental organizations and was a member of the Rhode Island Board of Dental Examiners 1891-1896. Before the turn of the century, he had established a busy practice in Newport.

In 1893, Dr. Gillett married Miss Elizabeth Pay, who survives him.

About 1900, Dr. Gillett came to New

York, where he built up a large and successful private practice and became a leader in organized dentistry. Strongly original in his work, he developed new technics, for which he devised his own instruments. He advanced the ideals of G. V. Black in operative dentistry, and was a pioneer in the evolution of the gold inlay, by the indirect method. In prosthesis, he perfected the technic of the round wire clasp and of the square lug boxing. While operating, he always sat on a four-legged tilted stool, one foot braced on a wedge-shaped cushion, the other in contact with the engine control. The chair was tilted almost to the horizontal, and the patient's head was practically in his lap. In this position, and with everything he wanted within reach, he worked with ease, celerity and extraordinary effectiveness. In the details of his operations, he was a vigorous perfectionist—a standard to which he did not hesitate to hold the practitioner at large. A member of most of the important dental organizations, local and national, he was always active in dental affairs. He was president of the First District Dental Society of New York, in 1913-1914, and the first president of the New York Academy of Dentistry, 1921 to 1925. In 1932, he published with Albert J. Irving a comprehensive book, "Gold Inlays by the Indirect System." In 1931, he was awarded the Jarvie Fellowship Gold Medal of the Dental Society of the State of New York; in 1933, the medal and scroll of honor of the Rhode Island State Dental Society. He was a member of the Rhode Island Dental Society, Harvard Dental Alumni Association, Harvard Odontological Society, American Academy of Dental Science, First District Dental Society, New York State Dental Society, American Dental Association, American Dental Society of Europe, American College of Dentistry, New York Academy of Dentistry, Committee of Community Dental Service, New York Tuberculosis and Health Association, International Association for Dental Research and the Delta Sigma Delta dental fraternity.

Dr. Gillett was one of the group that organized the School of Dentistry of Columbia University, and, in 1916, he was appointed professor of operative dentistry, being the first to hold that chair in this institution, where he remained an active and enthusiastic worker until February of this year. As professor of dentistry, he taught in various departments, and, when called away by illness, he was in the midst of his course on dental jurisprudence. He found great happiness in teaching his "boys," and was held by them in affectionate regard. During recent years, his work at the school had become a major interest.

About 1922, Dr. Gillett retired from active practice and spent a good deal of his time on his farm at Somers, Conn., where he raised tobacco and, later, apples. He was a camper and sportsman, and enjoyed especially his trips into the north woods with his old and close friend, Will Tracy. A thorough machinist, he liked a fast car, and he drove with great skill.

Formal retirement from practice came to him as an opportunity for broader activities in teaching and organization work. Besides his book, he wrote numerous articles on technical matters, always bringing out some new and ingenious idea or method. His habit of mind was forward-looking, confident of better things to come. Of large and powerful frame, he was a believer in regular exercise, and kept his body in excellent condition, into his eighty-second year. He maintained that old age had been pushed back fifteen years thereby. Shortly before the end, he told the writer that only severe winter weather had prevented his walking a mile each morning, which he accomplished in about fifteen minutes. Vigor of body and mind never failed him.

WILLIAM B. DUNNING.

DEATHS

ADELSON, ABRAHAM B., Chicago, Ill.; Northwestern University Dental School, 1911; died February 9.

ALE, CHARLES H., Trenton, N. J.; Philadelphia Dental College, 1902; died December 1942.

BECK, HENRY M., Wilkes-Barre, Pa.; University of Pennsylvania School of Dentistry, 1888; died February 2; aged 75.

BERKE, ARTHUR, New Rochelle, N. Y.; New York University College of Dentistry, 1927; died March 7; aged 37.

BIRKETT, LILLIAN E., (Eltringham), Pittsburgh, Pa.; University of Pittsburgh School of Dentistry, 1910; died February 21.

BOGARDUS, OBEDIAH, Keyport, N. J.; Pennsylvania College of Dental Surgery, 1882; died in January.

BUSH, WALTER, Poughkeepsie, N. Y.; Baltimore College of Dental Surgery, 1905; died February 18; aged 60.

CLAYPOLE, ISRAEL, Hawthorne, N. J.; New York College of Dentistry, 1889; died in January.

DOLSON, JAMES E., Evanston, Ill.; Chicago College of Dental Surgery, 1908; died February 23.

DUNNING, J. W., Spokane, Wash.; Northwestern University Dental School, 1899; died March 28, aged 68.

ECK, LOUIS, West Englewood, N. J.; University of Pennsylvania School of Dentistry, 1914; died September 1942.

EICHORN, MAX L., Newark, N. J.; New York College of Dentistry, 1899; died June 1942.

ELLIS, FRANKLIN H., Burlington, N. J.; Philadelphia Dental College, 1908; died August 1942.

ERCANBRACK, WILLIAM C., Elburn, Ill.; Northwestern University Dental School, 1901; died January 25; aged 65.

FARRELL, FRANK, East Orange, N. J.; Philadelphia Dental College, 1904; died July 1942.

FROESCHLE, W. F., Chicago, Ill.; Northwestern University Dental School, 1898; died February 7; aged 74.

GILMAN, R. E. Brooklyn, N. Y.; New York College of Dentistry, 1898; died September 12, 1942.

GOODENOUGH, LAMOTTE M., Paterson, N. J.; University of Pennsylvania School of Dentistry, 1905; died August 1942.

JOHNSON, ALFRED L., Chicago, Ill.; University of Minnesota College of Dentistry, 1925; died December 28, 1942.

JONES, FRANKLIN E., Collingswood, N. J.; Philadelphia Dental College, 1904; died in January.

KELLER, V. S., Chicago, Ill.; University of Illinois College of Dentistry, 1924; died December 11, 1942.

LANGERMAN, AUGUST, Maplewood, N. J.; Northwestern University Dental School, 1932; died August 1942.

NELSON, HENRY W., Chicago, Ill.; Northwestern University Dental School, 1924; died March 6; aged 44.

OCKERMAN, W. H., Correctionville, Iowa; Kansas City Dental College, 1891; died March 3.

OLSEN, CLARENCE E., Chicago, Ill.; Chicago College of Dental Surgery, 1919; died March 5; aged 50.

PERL, FRANK C., Chicago, Ill.; Chicago College of Dental Surgery, 1902; died December 21, 1942.

PITTS, E. M., St. Louis, Mo.; St. Louis University School of Dentistry, 1908; died February 4; aged 66.

PRINCE, JOSEPH H., Maplewood, N. J.; University of Pennsylvania School of Dentistry, 1924; died September 1942.

RIETZ, ARTHUR R., Evansville, Ind.; Chicago College of Dental Surgery, 1904; died January 13; aged 60.

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SPECHT, EMIL, Brooklyn, N. Y.; New York College of Dentistry, 1913; died March 1.

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THOMPKINS, GEORGE L. D., Interlaken, N. J.; Philadelphia Dental College, 1894; died October 1942.

INCIDENTS OF PRACTICE

Impacted Upper Right Third Molar

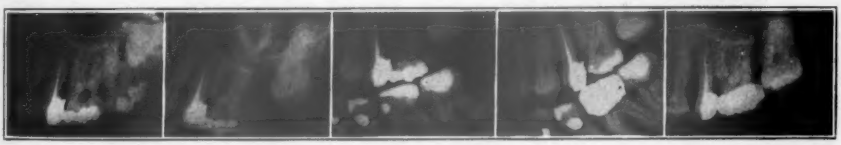
By Theodore Katz, D.D.S., New York, N. Y.

The case of an impacted upper right third molar that came into position after a decayed upper right second molar was extracted is here reported.

A film taken October 6, 1939 (A) shows the impacted tooth before removal of the second molar; June 12, 1940 (B), the impacted tooth emerging through the gingiva; November 7, 1941 (C), the tooth approaching its normal position; April 7, 1942 (D), the third molars almost in contact with the first molar; December 22, 1942 (E), the former impacted tooth in position.

The impacted upper third molar took approximately three years and two months to assume the position of the extracted second molar.

2802 Grand Concourse.



A B C D E

Eruption of impacted molar.

Technic for Removal of a Completely Embedded Mandibular Second Bicuspid

By Miles S. Buck, D.D.S., Dannemora, N.Y.

In the removal of any impacted tooth, distinct rules must be adhered to, in order to avoid postoperative difficulties on the part of the dentist as well as the patient. In my experience, an exact technic based upon a simple, safe and efficient procedure is essential.

In the accompanying x-ray film, one can readily see that a part of the coronal aspect of the imbedded biscuspid lies beneath the crown of the second permanent molar and the apex of the root extends mesially and downward toward the border of the mandible, closely approaching the superior border of the inferior dental canal.

It was essential to remove this tooth with as simple a technic as possible and in a safe and efficient manner, since it was necessary to avoid injury to the second permanent molar as well as pressure on the inferior dental canal, since pressure in this locality might pinch the nerve trunk and result in a partial facial paralysis.

After the area had been anesthetized locally, a lance was used to make a mucoperiosteal flap. Starting at a point on the gingival margin distally from the second permanent molar, the incision was made downward to the junction of the mucobuccal fold. The gum was then retracted around the second permanent molar and the incision was extended from the molar mesially along the alveolar ridge to the first biscuspid. The gum was retracted around the first bicuspid to the interproximal space between the cuspid and the bicuspid, then downward to the junction of the mucobuccal fold.

With a periosteal elevator, the muco-

periosteum was retracted, with exposure of the alveolar process, so that the operative area was in clear view.

With a No. 3 bur in a straight handpiece, perforations were made over the coronal part of the imbedded bicuspid on the buccal plate of bone. The reason for going through the buccal plate of bone was to conserve the alveolar ridge for future use in case the patient eventually had to wear a lower denture.

With a T-chisel, perforated bone was removed over the crown until the crown of imbedded tooth was completely exposed on the buccal surface. Then the opening was enlarged distally, and about one third of the root attached to the crown was exposed. The crown and this part of the root were completely severed from the remaining encased root by

Embedded bicuspid.

means of a bur and elevator. The crown and part of the root severed were split longitudinally with a bur and elevator. Each part was readily removed.

The removal of the remaining root was simple. A No. 3 bur was used to drill a hole in the tip of the root showing; a fine pointed elevator was inserted in the hole in the root, and with the margin of the window that was cut to expose the crown as a fulcrum, the root was popped out into the vacated area, which had been occupied by the crown, and readily removed.

The area was then syringed well with a warm saline solution; a drain was placed in the bone cavity (iodoform gauze saturated with an obtundent paste), and the flap replaced in position. Three stitches were taken with silk thread, one near the gingiva, distally from the second permanent molar; one mesially from the first bicuspid, and one part way along the alveolar ridge.

The patient was dismissed with the instructions to take a sedative (barbital) for the pain; use a hot Epsom salts mouthwash every half hour for the next twenty-four hours during his waking hours; see that his bowels were kept open, and apply the icebag to the face and well down on the neck, to keep the swelling down and keep any inflammation from traveling. The iodoform gauze wick was removed in twenty-four hours and all three stitches at the end of the fourth day. Recovery was rapid, with no untoward effects.

Teeth in Exchanged Position

By D. WEILL,* Ft. Leavenworth, Kan.

A MAN, aged 30, presented himself for routine dental examination, which revealed that the lower left lateral incisor and lower left cuspid had exchanged positions. They both were in reasonably good occlusion and no annoyance had ever been experienced by the patient.

The case history stated that in Scotland,

Transposed cuspid and lateral incisor.

twenty years previously, at the age of 10 years, the patient was playing backyard cricket and had both of the above mentioned teeth knocked out. He replaced them himself, unknowingly in the wrong sockets. Healing was uneventful and no orthodontic measures were instituted. Both teeth are vital.

U. S. Disciplinary Barracks.

*First Lieutenant (DC).

Impacted Supernumerary Tooth

By A. R. HUBERWALD* and A. L. J. KILLEBREW†

IN the February issue of the THE JOURNAL, San Antonio, Texas, we read with interest the reports on supernumerary teeth. We submit herewith a report of our procedure in a case of impaction of a supernumerary.

January 27, 1943, an aviation cadet, aged 21, reported to the Dental Clinic, Army

Fig. 1.—Position of impacted supernumerary.

Fig. 2.—Condition after operation.

Air Forces Classification Center, San Antonio Aviation Cadet Center, San Antonio, Texas, complaining of pain above the upper right lateral incisor, the crown of which was restored by a large three-quarter gold crown. The x-rays revealed a supernumerary tooth, with small radiolucent area at the apex.

The tooth may have become devitalized either from pressure of the supernumerary tooth or from shock produced by preparation for a large three-quarter crown.

A flap was made exposing the labial plate of bone, which appeared very soft and spongy, a condition indicating that the infection was of long standing. A root-canal filling and apicoectomy were performed, allowing access to the supernumerary tooth, which was then cut in half and each segment removed. The whole area was curetted, and sulfathiazole powder placed in the orifice. The flap was returned and retained with two sutures. Recovery was uneventful.

The opening which was made through the lingual surface of the three-quarter crown was permanently filled at a later sitting with gold foil.

The x-ray films were taken before and after the operation. (Figs. 1 and 2.)

San Antonio Aviation Cadet Center.

*Major (DC).
†Captain (DC).

Dental Focus for Referred Pain in the Ear

By M. HILLEL FELDMAN, D.D.S., New York, N. Y.

THE accompanying roentgenograms show a sclerotic area in the bucuspid region of the mandible in a patient suffering constant pains in the ear on the same side.

Examination of the ear and sinusues showed no local conditions responsible for the complaint. Dental examination disclosed a radiopaque body taking the form of the bicuspid alveolus.

Fig. 1.—Condition during operation.

The technic employed consisted of penetration of the buccal plate of the mandible with a drill, and burring away of the mass with a large round surgical

bur. Figure 1 was taken during the course of the operation to determine the progress, and the amount still to be removed. Figure 2 shows the successful removal of the entire mass.

Fig. 2.—Appearance after operation.

In my experience, these areas should be surgically interfered with only when there are neuralgic symptoms that might be traced to pinching of the terminal nerve fibers. Clinically symptomless radiopaque areas should not be interfered with.

730 Fifth Avenue.

Impacted Third and Fourth Molars

By SAMUEL GOTTLIEB, D.D.S., New York, N. Y.

FIGURES 1, 2 and 3 illustrate a case of impacted molars in a man aged 24. The condition was bilateral in the lower jaw and present in the upper right side. In the upper left side, three molars were present.

Fig. 1.—Horizontal position of impacted molars.

While fourth molars are in themselves a not uncommon anomaly, the double-decked horizontally impacted condition of these lower third and fourth molars was interesting.

The x-ray films were taken during a routine examination of the mouth. The patient did not complain of any unusual symptoms. No pain, trismus or swelling was present.

Fig. 2.—Position of impacted molars.

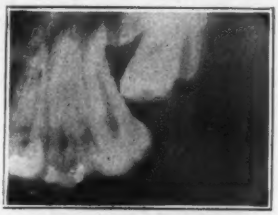


Fig. 3.—Impaction in upper right jaw.

295 Central Park West.

Carving Anterior Inlays

By V. VAN BECK, D.D.S., Oshkosh, Wis.

I AM offering a suggestion to facilitate the carving of and to produce better fitting anterior inlays.

It has always been rather awkward for me to hold a mirror in the left hand and at the same time hold the wax impression securely in place while carving with the instrument held in the right hand. Every movement of the wax pattern in carving must cause an indeterminable distortion of the wax.

Through the use of a small vanity mirror usually found as an accessory in a woman's purse, which is held by the assistant (preferably) or by the patient, a brilliant light is reflected on the wax while the left hand of the dentist is free to hold the wax firmly in place.

This simple aid has reduced to a large degree the difficulty of carving anterior inlays.

46 Washington Boulevard.

Tooth Within a Tooth

By ROLLIN D. JENNEY, D.D.S., Bennington, Vt.

A CHILD, aged 8 years, was referred to me by Dr. Francis Tomasi for the extraction of an abscessed central incisor which showed a very peculiar formation.

On removal, the tooth, since it showed nothing on the outside of any interest except the peculiar shape, was cracked open and further examined and a small

Fig. 1.—Tooth within the incisor.

Fig. 2.—Appearance after extraction.

supernumerary tooth was found within it.

The supernumerary tooth was cracked and there was pus in the pulp chamber, but the large pulp in the central incisor was firm and to all appearances vital.

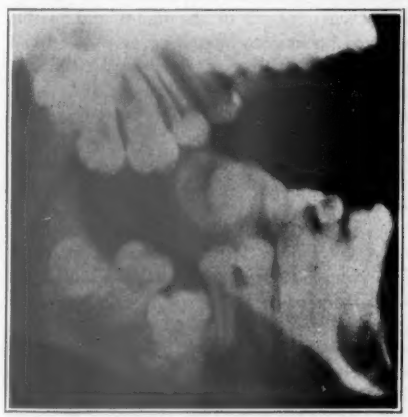
The tip of the supernumerary was lost, but extra-oral x-ray examination revealed the whole story, which is strange enough without consideration of the sound appearance of the pulp in the parent tooth.

Impacted Molar; Fractured Mandible

JOSEPH E. EWING, D.D.S., Philadelphia, Pa.

A BOY, aged 14, presented a sore spot on the side of the face, the area corresponding in area to that of the first permanent molar roots. There was no swelling, but upon digital examination, an unusual area was felt.

Upon questioning the patient, it was learned that he had received a blow on the face during a football game and ever since then he had had this sore spot. A roentgenogram revealed an impacted lower first permanent molar with a slight fracture im-



Complete impaction of lower right molar.

mediately under the apex of the molar roots.

After a buccal flap was laid back, the tooth was removed under local anesthesia and the area thoroughly irrigated. A light packing of iodoform gauze was placed in the socket and then lightly sutured.

The fracture was reduced immediately by the usual methods of intermaxillary wiring. Healing was uneventful and was complete in about five or six weeks.

The remarkable feature about this case was the complete impaction of the lower first molar. I have observed a few cases of partial impaction, but this is, I believe, the only case as yet recorded where the impaction was complete.

4044 N. Twelfth Street.

QUESTIONS AND ANSWERS

The answers here published have been prepared by authorities, but do not represent the opinion of the American Dental Association as an organization or of any other official bodies unless specifically stated in the reply.

To the Editor: I am desirious of finding out whether anything has been printed regarding allergy to acrylics or plaster, causing general skin disorders, and, if so, in what issue of THE JOURNAL it has appeared.

I have been bothered for at least two years with a rather vicious disorder that seems to respond to no treatment that I have attempted. I can trace it to no specific thing and am inclined to think that I may be allergic to something like the acrylics or have finally become allergic to plaster or procaine after all these years. The condition started originally with an inflammation and itching of the wrists, back of the hands and in the web of the fingers, beginning as tiny watery eruptions, and has since spread all over body and even developed into rather hard subcutaneous lumps that come and go on short notice.

G. S. W., Pueblo, Colo.

ANSWER

The Editor of THE JOURNAL forwarded your letter to me for consultation. I am interested in the subject of dermatitis associated with dental materials. Most of your symptoms can be explained on the basis of sensitivity to some dental material. However, upon consulting with the dermatology department of our medical college, I was told that the "rather hard subcutaneous lumps" are usually not associated with a simple dermatitis. Consequently, it is suggested that you visit a reputable dermatologist, in order to arrive at a diagnosis.

M. K. HINE.

CORRESPONDENCE

To the Editor: In the December issue of THE JOURNAL, under "Questions and Answers," you printed a question concerning the most effective methods for preventing a 3-year-old from sucking his thumb, and an answer to that question over the signature "C. R. B."

While "Questions and Answers" is prefaced by a statement that answers given do not reflect an official opinion of the Association I consider it reprehensible that one of the methods given for preventing thumb-sucking was "a good sound spanking."

If the thousands of dentists who read THE JOURNAL were to pass on that sort of advice to the many anxious mothers who come to them daily for an answer to a perplexing question, it would indeed be a tragedy. That the author of the suggestions is not well convinced of the effectiveness of such a method of treatment is evident when he goes on to give three other methods, all involving the element of punishment and pain. If a "good sound spanking" was such a cure-all, there would be no need for the other modes of treatment; indeed, life would certainly be simplified for the millions of parents who are daily confronted with not only the problem of thumb-sucking, but also many other problems of the eating, sleeping and behavior habits of their children.

For many years, parents, educators, pediatricians, psychologists, orthodontists, psychiatrists and dentists have pondered and debated this question of thumb-sucking, and very few, if any, of such authorities have recommended a "good sound spanking." A more reasonable approach must be to find the cause. Why does a child suck its thumb? Is it an emotional or a psychologic need or desire? If it is either, spanking will not cure it, but will surely create new problems.

I wish that problems of such intricate nature would be treated with more depth and wisdom in the pages of scientific publications like THE JOURNAL.

ROBERT R. LEMKIN
Fulton Avenue at Stratford Road
West Hempstead, L. I., N. Y.

CURRENT LITERATURE

Journal of Dental Research
February 1943

A Contribution to the Knowledge About Dye Penetration in Living Human Enamel. H. Berggren—1.

*Grenz Ray Studies of Enamel Matrix Formation and Calcification. Edmund Applebaum (Columbia University)—7.

The Innervation of Dentin. Julian Ambrose (Sydenham Hospital, N. Y.)—13.

*Secretion of Intravenously Injected Electrolytes in the Submaxillary Saliva of Cats. J. H. Wills (University of Rochester)—27.

*Inhibition of Experimental Dental Caries in the Rat by Iodoacetic Acid. Peter P. Dale and Vernon H. Powell (University of Rochester)—33.

*Observations on Induced Caries in Rats. IV. Inhibiting Effect of Fluoride Ingested Post-Eruptively and Prior to the Caries Producing Diet. F. J. McClure (National Institute of Health, U. S. Public Health Service)—37.

*A Quantitative Method for Evaluating Physical and Chemical Agents Which Modify Production of Acids in Bacterial Plaques on Human Teeth. R. M. Stephan and B. F. Miller (University of Chicago)—45.

*The Effect of Synthetic Detergents on pH Changes in Dental Plaques. R. M. Stephan and B. F. Miller (University of Chicago)—53.

*The Effect of Urea in Counteracting the Influence of Carbohydrates on the pH of Dental Plaques. R. M. Stephan (University of Chicago)—63.

*Factors Influencing Penetration of Synthetic Detergents and Certain Other Compounds into Dental Plaque Material. J. A. Muntz and B. F. Miller (University of Chicago)—73.

Grenz Ray Studies of Enamel Matrix Formation and Calcification

THERE are two processes in enamel development as disclosed by the grenz ray: (1) matrix formation (organic phase-radiolucent-acid insoluble) and (2) calcification (inorganic phase-radiopaque-acid soluble). The matrix formation rhythm occurs first as a series of rhythmic bands along the lines of Retzius, and then the calcification rhythm occurs in transverse relation to these bands. The calcification rhythm obscures the formation rhythm in adult enamel, but, in the decalcification occurring in caries, the original matrix pattern is again disclosed. On the other hand, injuries to the enamel during matrix formation are covered up by the calcification occurring later, in transverse relation to the Retzius lines.

Secretion of Intravenously Injected Electrolytes in the Submaxillary Saliva of Cats

RADIOACTIVE sodium, potassium, chlorine, fluorine and phosphorus injected into the femoral vein of the cat during submaxillary salivation produced by either chorda excitation or pilocarpine injection appeared in the saliva within one minute after administration. A second dose of pilocarpine after injection of the radioactive elements augmented the rates of secretion of sodium and chlorine by increases in both the rate of salivary secretion and the concentration in the saliva. It augmented the rates of secretion of potassium and phosphorus entirely by increase in the rate of salivation. Potassium entered the stimulated submaxillary gland from the blood by engulfment rather than by exchange, the ingested material appearing in the saliva only after a time lag.

Inhibition of Experimental Dental Caries in the Rat by Iodoacetic Acid

FIFTY-TWO young female albino rats were maintained for 150 days on a caries-producing diet of coarse corn. Of these, thirty-nine received supplements of iodoacetic acid in the food or the drinking water or both. Comparison of dental caries scores of the animals at the close of the experimental period revealed that although the pressure of iodoacetic acid in the food alone inhibited caries, its presence in the drinking water was also capable of inhibiting experimental carious lesions in the rat.

Observations on Induced Caries in Rats. IV. Inhibiting Effect of Fluoride Ingested Posteruptively and Prior to the Caries Producing Diet

RATS aged 40, 100 and 200 days were given fluoride prior to being placed on a caries-producing diet. The results indicate that this prefluoride period brought about an appreciable resistance to rat caries, particularly in the youngest rats. Fluoride was found to have increased notably in the dentin and enamel of the rats' teeth, the effect apparently being due to incorporation of fluoride in the adult tooth. In the light of these results, it seems reasonable to expect that should the adult human tooth be made to acquire fluorine similarly, as a secondary deposit, it might thereby be partially protected against dental caries.

The Effect of Synthetic Detergents on pH Changes in Dental Plaques

SEVERAL synthetic detergents (e.g., alkyl dimethyl benzyl ammonium chloride) have been tested for their ability to inhibit the lowering of pH that occurs in dental plaques after application of carbohydrates. Comparison of the pH changes in plaques produced by rinsing the mouth with 10 per cent solutions of glucose after application of the detergents with pH changes before application of the detergents showed that applications of the detergents inhibited the lowering of the pH of plaques by application of glucose. The inhibitory effect of application of the detergents was most marked on thin plaques and less marked on thick plaques.

A Quantitative Method for Evaluating Physical and Chemical Agents Which Modify Production of Acids in Bacterial Plaques on Human Teeth

THE pH of bacterial deposits on accessible tooth surfaces and carious areas may be determined *in situ* by the antimony electrode method. These determinations can be made frequently in the same areas without destroying the bacterial deposit. It has been found that a characteristic pH curve is obtained when the teeth are rinsed with a solution of 10 per cent glucose. In general, there is a sharp drop in pH within a few minutes after the application of the carbohydrate, and a return to the original pH within from thirty to sixty minutes. If as soon as the pH has returned to the original value, the glucose rinse and the pH determinations are repeated, the same type of curve is obtained as after the first rinse. The areas under the two curves duplicate each other to within 10 per cent.

To study the influence of compounds which modify pH changes on tooth surfaces, the foregoing method is employed by applying test solutions before the second glucose rinse. The reduction of the area under the curve obtained after application of the test solution gives a measure of its effectiveness in preventing the pH drop produced by administration of glucose.

The Effect of Urea in Counteracting the Influence of Carbohydrates on the pH of Dental Plaques

BACTERIAL plaques which grow on human teeth have both the ability to rapidly form acid from carbohydrates and to form alkali (ammonium carbonate) from urea. The influence of various concentrations of urea in counteracting the pH effects of glucose on plaques was studied *in vitro* with the glass electrode and *in situ* with the antimony electrode. It was found that slight concentrations of urea (less than 1 per cent) give only a retarding action on the pH drop produced by an excess of glucose. High concentration of urea (e.g., 50 per cent), however, not only caused a rise in the pH of plaques in the presence of glucose, but also inhibited production of acids from further applications of glucose.

Factors Influencing Penetration of Synthetic Detergents and Certain Other Compounds into Dental Plaque Material

THE use of some synthetic detergents (e.g., alkyl dimethyl benzyl ammonium chloride) at concentrations as low as 1:30,000 will completely prevent acid formation from carbohydrates by homogenized dental plaque material. However, much higher concentrations do not inhibit entirely the production of acid by intact plaques. To study the factors in determining the rate of penetration of various inhibitory compounds into intact plaques, a method was devised whereby "artificial plaques" of known thickness could

be prepared. The "plaques" may be treated with inhibitory compounds and their ability to decompose glucose following such exposure be determined.

The degree of inhibition produced by the use of antibacterial synthetic detergents and of urea was found to be a function of (a) the thickness of the plaque, (b) the concentration of inhibitory compound and (c) the length of time of exposure to the inhibitor. The experiments indicate that the concentration of inhibitor is of great importance in providing adequate diffusion into plaques in a length of time which might be feasible in oral prophylaxis.

The Bones of Small Fish as a Source of Nutritionally Available Calcium and Phosphorus

By K. P. BASU, H. N. DA and M. N. BASAK

CALCIUM deficiency constitutes one of the commonest defects in typical Indian dietaries. Since fish is an important ingredient of the rice-eaters' diet in certain sections of India, an investigation was made to determine the nutritional availability of the calcium and phosphorus in the bones of small fish. Metabolic studies with rice-fish diets in which the bones were discarded showed that the subjects suffered from a negative calcium balance. When 70 gm. of small whole fish was added to the typical calcium-deficient diet, the dietary calcium was augmented by 577 mg. (average), 70 per cent of which was retained in a great many subjects, with a resultant positive calcium balance. The phosphorus content of the diets was increased by an average of 673 mg., of which one-half was retained.—*Ind. J. M. Res.*, 30:3, July 1942.

E. GUNNAR JOHANSSON.

Degradation of Glucose by Staphylococcus Albus

By L. S. FOSDICK and G. W. RAPP

THE degradation of glucose by enzymes of *Staphylococcus albus* was studied, the organism being isolated from human saliva or tooth scrapings and grown in pure cultures by the usual method on solid 1 per cent dextrose media at pH 5.4, 6.7 (normal resting saliva) and 8.6. It was found that staphylococcal enzymes can promote all the reactions of the Embden-Myerhof scheme. Lactic acid, however, was produced only under anaerobic conditions. Two new compounds were found, alpha-keto-gamma-hydroxyvaleric acid and alpha-keto-gamma-hydroxyvaleric aldehyde. Both were isolated and identified, the latter in the form of the dioxime. Alpha-keto-gamma-hydroxyvaleric acid may be important in the conversion of carbohydrate to fat.—*Arch. Biochem.* 1:379, February 1943.

PETER P. DALE.

Metastasis of Mixed Tumors of the Salivary Glands

By R. M. MULLIGAN

OF twenty-one reported cases of metastatic tumor of the salivary glands, eight involved men, thirteen women, with ages varying from 31 to 65. In twelve cases, the tumor was in the parotid region; in six, in the submaxillary region; in two, in the hard palate; and in one, in the sublingual gland. The duration of the lesion before examination in nineteen of the cases varied from two months to nineteen years. In eleven cases, the largest size attained by the growth ranged from that of an olive to more than half the size of the head. Metastases appeared in the lungs in eighteen cases, in the pleura in twelve, in the liver in ten, in skeletal structures in eight, in the lymphatic system in six, in the kidney in three and in the spleen in two.—*Arch. Pathol.*, 35:357, March 1943.

PETER P. DALE.

Enamel Hypoplasia in Idiopathic Epilepsy

By R. SPITZER

EXAMINATION of sixty-five epileptics in a mental hospital in Berlin revealed thirty-three cases of enamel hypoplasia of the permanent teeth. Clinical and serologic findings indicated that none suffered from congenital syphilis. Enamel defects were of the same character in every case, differing only in size or distribution. The buccal and labial surfaces of the crowns appeared to be affected more often than the lingual. Defects involving the circumference of some teeth were observed. A striking involvement of teeth belonging to the same embryonic period was noted. Defects in these teeth were identical in locality, form and extent in any

single case. The incidence of hypoplastic enamel lesions in the epileptic is in contrast with that of similar lesions observed in congenital syphilis, nutritional deficiencies or metabolic disturbances in that the hypoplasia of epilepsy was not associated with lesions elsewhere in the body.—*D. Record,* 63:66, March 1943.

PETER P. DALE.

Mottled Nails: An Early Sign of Fluorosis

By LEO SPIRA

MOTTLED enamel is frequently associated with defective nails and hair. In contrast to mottled enamel, the nails regain normalcy when treatment against fluorosis is instituted and the affected outgrowing portion is removed. Conversely, if fluorosis recurs, the nails often repeat the signs of mottling. Consequently, mottling of the nails is a basis for tests for the presence of fluoride. Loss of luster, brittleness and opaqueness are signs of mottling in the nails, which frequently become furrowed in transverse bands and tend to curl clawlike when allowed to grow beyond the finger tips. A considerable portion of the normal nail may be replaced with areas of dull, opaque chalky white specks, patches or bands—*J. Hyg.,* 43:69, January 1943.

E. GUNNAR JOHANSSON.

A Physician Looks at School Dental Programs

By G. M. WHEATLEY

THE operation of a school dental health program involves primarily the teacher and the community dentist, and secondarily the school nurse. The teacher is responsible for informing the parents that the child requires a dental examination, for conducting systematic contacts with the child's home until he receives attention and for recording the child's progress during the school term in obtaining treatment. Interviews with neglectful parents conducted by the hygienist gave 70 per cent more satisfactory results than repeated notices. Examinations should be made in a dental office. Education of the child in regard to dental hygiene is the function of the school. Teaching children to depend on the school for dental treatment causes their graduation to mark the end of attention to the teeth. Cooperation of the dental profession with the schools is essential for the success of any school dental program. —*Am. J. Pub. Health,* 33:120, February 1943.

E. GUNNAR JOHANSSON.

Concentrations of Sulfadiazine in Human Saliva Attained by Chewing Paraffin Containing Sulfadiazine

By J. H. ARNETT ET AL.

CONCENTRATIONS of sulfadiazine in the saliva as high as 800 mg. per hundred cubic centimeters were attained by chewing paraffin impregnated with sulfadiazine for periods ranging from five minutes to two hours. The amount of sulfadiazine found in the saliva appeared to increase with time during the first thirty minutes of chewing, apparently reaching the maximum concentration in most subjects at that time. Paraffin blocks for chewing contained 0.375 gm. (about 5 grains) of sulfadiazine. Their use is expected to favorably affect the course of acute hemolytic streptococcal infections of the throat without recourse to large systemic doses of the drug.—*Proc. Soc. Exper. Biol & Med.,* 52:54, January 1943.

H. B. MCCAULEY.

Bone Heteroplasia in a Case of Dilantin Hyperplastic Gingivitis

By E. V. ZEGARELLI and D. E. ZISKIN

CALCIFIED masses were found in the corium of the gingivae in a case of dilantin hyperplastic gingivitis in a girl aged 16 who was subject to epileptic seizures and had been given increasing doses of dilantin, finally stabilized at four 1.5 grain tablets of dilantin and three 0.03 gm. pills of phenobarbital daily. Biopsy of the interdental papilla revealed epithelial and connective tissue contributions to the gingival hypertrophy evident throughout the mouth. Calcified masses of undifferentiated bonelike tissue were observed in the corium midway between the basal membrane of the epithelium and the periosteal layer. The masses were irregularly shaped, without lacunae, osteocytes or haversian systems, and stained deeply with hematoxylin. Their presence was apparently the result of a process of bone heteroplasia arising from metaplasia of dilantin-stimulated fibroblasts assuming

the function of osteoblasts.—*Am. J. Orthodontics,* 29:152, March 1943.

H. B. McCAULEY.

Maxillary Sinusitis of Dental Origin

By W. H. BAUER

THE roentgenogram is not a reliable indicator of the dental origin of maxillary sinusitis. Microscopic examination of sixteen specimens obtained at necropsy indicates that the antral mucosa is often affected in cases of periapical infection separated from the floor of the sinus by a thick layer of bone. The network of vessels and lymphatics extending from the peridental membrane to the antral mucosa appears to be a channel for the spread of infection from the teeth through the bone to the sinus. Local inflammatory reactions of the mucosa were observed in severe cases of "pyorrhea," periapical disease and chronic pulpitis. The changes included all gradations of chronic inflammation in the periosteum, mucous membrane proper and pseudostratified ciliated epithelium. The antral mucosa was transformed into dense fibrous tissue in reparative stages. No conclusions regarding the extension of localized sinus lesions of dental origin are as yet possible.—*Am. J. Orthodontics,* 29:133, March 1943.

H. B. McCAULEY.

Resection of the Mandible

By W. H. PEARSON

Two cases of extreme Class 3 malocclusion are presented in which resection of the mandible successfully restored the occlusion to normal and greatly improved the facial appearance. In each case, the etiology was studied and corrective measures were taken previously to surgical intervention. Resection was accomplished with a small bone bur and a chisel, parting the mandible in a line between the retrothird molar area and the angle. The nerves and blood vessels of the jaw were not disturbed except for stretching when the anterior fragment was adjusted to occlusion with the maxilla. During the period of healing, the occlusion was maintained by wire ligatures binding the maxillary and mandibular teeth. Advantages of the technic include the opportunity to create a more distinct mandibular angle, the absence of scars of the face and the comparatively slight discomfort caused the patient.—*Am. J. Orthodontics,* 29:141, March 1943.

H. B. McCAULEY.

"Speaking for the Profession . . . "

By J. W. MILFORD

To an extent that is becoming increasingly recognized in all fields of human endeavor, public service waits upon public interest; for unless the public welcomes and utilizes a particular service, that service cannot long survive. And the resulting demise may involve serious loss to the public as well as to those proffering or rendering the service. Hence, those who render a service of value to the public—the dental profession, for example—bear the dual obligation of (1) providing that service in constantly improved form and (2) keeping the public properly informed of and "sold on" it. The need for more public dental health education is attested to by the present appalling number of "dental cripples." This educational effort, to attain its fullest potentialities, must (1) dramatize the subject in appealing, interesting form and (2) arouse subjective interest in it on the part of the public—interest that translates itself into the desire to "see the dentist about it."—*J. 2nd Dist. D. Soc.,* 29:61-67, February 1943.

A Standard Procedure for Determining the Abrasion of Dentifrices

By MAURICE L. TAINTER and SIDNEY EPSTEIN

THE apparatus and a method described are employed for determining the abrasion of dentifrice materials on the various structures of teeth under carefully standardized conditions. The procedure consists in measuring the amount of abrasion, with a calcium carbonate powder as a standard of reference and a "round-robin" procedure, which reduces the inherent variability of the teeth. With this procedure, the mean abrasion can be determined on the seventy-two cusps of eighteen teeth, with a variability of about 15 per cent. The use of a toothbrush with bristles made of synthetic plastic material, instead of natural bristles, causes less wear on the tooth. In addition, the synthetic brushes are much more resistant to wear, so that their use more than compensates for their greater cost. Under controlled conditions, about one-half of the abrasion produced by

the use of the precipitated calcium carbonate of the U. S. Pharmacopoeia, adopted as a standard of reference, was found to be due to the consistency of the calcium carbonate itself, and the remainder, to the abrasion of the brush. These tests were made in the presence of a liquid consisting of 50 per cent glycerine in water as a constant lubricant throughout. The concentration of the calcium carbonate in the slurry affected the amount of abrasion to only a minor degree. However, when even small amounts of silica were added to the carbonate, a great increase in the amount of abrasion was quickly demonstrable. Accordingly, traces of contaminants would be increasingly important in a dentifrice as the hardness of the contaminating material increased, whereas large amounts of relatively soft materials might be tolerated without increase of the abrasiveness. Dentin was found to have worn approximately twenty-five times faster than the enamel tips of the cusps of the mandibular molars studied, and the cementum about thirty-five times faster. The apparatus and the standardized procedure described afford a means of testing the abrasion of dentifrice ingredients and of determining various factors in the degree of abrasion, under reproducible conditions not available previously.—*J. Am. Coll. Dentists,* 9:353-380, December 1942.

Interrelation of Large Parenteral Doses of Estrogen and Vitamin A and Their Effect on the Oral Mucosa

By D. E. ZISKIN, S. N. ROSENSTEIN and L. DRUCKER

IN experiments on rhesus monkeys, an attempt was made to demonstrate the potential connection between hyperkeratinization of the oral mucosa due to long-term large-dose estrogenic therapy and that from vitamin A deficiency. Daily doses of vitamin A (10,000 I.U.) and estrogen (500 R.U.) given over a period of thirty-one days caused amelioration of hyperplasia and keratinization produced by administration of 1,000 R.U. of progynon B for fifty-three days to two subadult animals, one normal, the other castrated. Degenerative changes in the gingivae of a third animal caused by daily administration of vitamin A (10,000 I.U.) for thirty days were eliminated, and the mucosa became hyperplastic with restoration of tone, on administration of combined vitamin A and estrogen (10,000 I.U., 1,000 R.U.) daily for thirty subsequent days. Although estrogen and vitamin A suppressed the treatment effects in both experiments, the results were not similar.—*Am. J. Orthodontics,* 29:163, March 1943.

H. B. MCCAULEY.

Elements of Dental Medicine and Their Application to the Treatment of Dental Caries

By R. G. TORRENS

THE practice of dental medicine (electronic medicine) is the control of dental disease through control of the electronic content of the blood plasma. Progressive caries in children may be treated successfully by the addition of suitable alkalis to the diet. Administration of 15-grain tablets of nutritive salts (C.T.600) twice daily for thirty days and once daily thereafter for one or two years has given excellent results in limiting dental decay in children. A tablet contains 5 grains of potassium citrate, 2.3 grains of calcium carbonate, 2.25 grains of potassium chloride, 2 grains of calcium phosphate, 1.3 grains of sodium chloride, 0.8 grain of calcium citrate, 0.4 grain of magnesium sulphate, 0.5 grain of magnesium carbonate, 0.25 grain of magnesium phosphate, 0.2 grain of iron citrate, 0.01 grain of potassium aluminate, 0.01 grain of sodium silicofluoride and 0.001 grain of potassium iodide. (Abstractor's note: Fluorine may be the effective agent in nutritive salts C.T. 600.)—*S. Afr. D. J.,* 17:13, January 1943.

PETER P. DALE.

Scope and Program of Industrial Dental Health Service

By R. M. WALLS

IN October 1941, the American Dental Association adopted a set of standards or "Essentials of an Industrial Dental Service" that had been presented by the Committee on Economics. This action was the culmination of an interest of several years upon the part of the committee, who had, in keeping with a few individual members, recognized the need for better organization and service

in caring for the ill and injured in industry. Within a few months, the U. S. Public Health Service had appointed an officer to work through the state divisions of Dental Health and Industrial Hygiene in the development of industrial plants and other agencies in dealing with their dental health problems. A great interest is being developed among state and local dental societies. Industries with services already established are welcoming this interest upon the part of the organized profession and many plants are considering the adoption of dental health services. The dentists interested in this type of service are establishing an organization which will put them in a better position to improve the conditions under which they operate and also their own abilities to function as a part of the general health service. Certainly no better attack can be made upon absenteeism in industry that results from ill health.—*J. 2nd Dist. D. Soc.*, 29:175-183, April 1943.

Acute Sodium Fluoride Poisoning

By W. L. LIDBECK, I. B. HILL and J. A. BEEMAN

THE recent accidental ingestion of 17 pounds of sodium fluoride in a 10-gallon mixture of scrambled eggs at the Oregon State Hospital resulted in the highest morbidity and mortality reported from this poison. Of 263 cases, forty-seven terminated fatally. Analysis revealed that the eggs contained 3.2 to 13 per cent of sodium fluoride distributed spottily. Many patients rejected the food because of its salty or soapy taste. Those who accepted it complained of oral numbness. Severe nausea, vomiting and diarrhea occurred abruptly and at times simultaneously. Abdominal burning and cramplike pains appeared soon after the meal. General collapse developed in many victims at variable periods, apparently depending on the fluoride concentration. Collapse was characterized by pallor, weakness, absence or threadiness of the pulse, shallow unlabored respiration, weakness of the heart tones, clamminess of the skin, cyanosis and dilation of the pupils. With these symptoms, death almost invariably occurred. In cases in which death was delayed or recovery took place, paralysis of the muscles of deglutition, carpopedal spasm and spasm of the extremities were noted. Convulsions and abdominable rigidity or tenderness did not occur. In most cases, death took place between two and four hours after the meal, although in a few it was delayed for eighteen to twenty hours. The fatal dose of sodium fluoride is 5 to 10 gm. (Baldwin).—*J. A. M. A.*, 121:826, March 13, 1943.

PETER P. DALE.

Intraoral Radium Treatment of Cancer of the Mouth. I. Choice of Method

By J. R. NUTTALL

For all practical purposes, the treatment of malignant tumors of the mouth is the treatment of squamous carcinoma. For success, the dosage of gamma rays must be taken to tissue tolerance levels, between 6,000 and 8,000 r units in an over-all interval of seven to ten days. The irradiation of normal tissues must be held to a minimum. It is important to assess the effects of age, the extent and location of the lesion and the condition of the patient, in deciding whether treatment shall be curative or palliative. Where practicable, surface treatment by means of a radium mold is preferable to interstitial irradiation from implanted radium or radon. Choice of method depends mostly on the site of the lesion. The teeth should not be disturbed except for cleaning or when they irritate the treatment area. Pretreatment hygienic measures are important. It is dangerous to extract teeth from a treated area even several years after irradiation because of the possibility of bone necrosis. In 422 cases of oral cancer treated in the Manchester Radium Institute in 1932 and 1933, 28 per cent of the patients survived five years or more. In 222 cases of glandular metastases, 12 per cent lived five years. But of the 220 without metastases, 46 per cent lived five years.—*Brit. J. Radiol.*, 16:45, February 1943.

H. B. MCCAULEY.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS, Cincinnati, Ohio, October 8-9.

CLEVELAND (OHIO) DENTAL SOCIETY SPRING CLINIC, May 10-12.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month, from October to June, at the United States Public Health Service Auditorium, Washington.

KANSAS STATE DENTAL ASSISTANTS ASSOCIATION, Kansas City, Mo., May 11-13.

MONTREAL (CANADA) DENTAL CLUB, October 20-22.

NATIONAL BOARD OF DENTAL EXAMINERS, May 3-4.

NEW YORK SOCIETY OF ORTHODONTISTS, New York, November 8-9.

NEW YORK STATE SOCIETY OF DENTISTRY FOR CHILDREN, Syracuse, May 21.

ONTARIO DENTAL ASSOCIATION, Toronto, Canada, May 17-19.

ROOT CANAL THERAPY ORGANIZATION, Chicago, February 1944.

WESTERN RESERVE DENTAL COLLEGE ALUMNI MEETING, Cleveland, Ohio, May 11.

WOMEN'S DENTAL SOCIETY OF NEW YORK, New York, May 20.

STATE SOCIETIES

May

Arizona, at Phoenix (7-8)
Connecticut, at Hartford (7-8)
Georgia, at Atlanta (17-19)
Illinois, at Peoria (10-14)
Indiana, at Indianapolis (17-19)
Iowa, at Des Moines (3-5)
Kansas, at Kansas City, Mo. (11-13)
Maryland, at Baltimore (3-4)
Massachusetts, at Boston (17-20)
Missouri, at Kansas City (11-13)
Montana, at Helena (6-8)
Nebraska, at Omaha (10-12)
New Jersey, at Newark (4-5)
New York, at Syracuse (18-21)
North Carolina, at Raleigh (3-5)
North Dakota, at Fargo (10-11)
Pennsylvania, at Pittsburgh (4-6)
South Carolina, at Columbia
South Dakota, at Huron (9-11)
Vermont, at Burlington (19-20)
West Virginia, at Parkersburg (17-19)

June

Colorado, at Denver (17-19)
District of Columbia, at Washington (8)
Idaho, at Twin Falls
Nevada, at Reno
New Hampshire, at Manchester (9)
New Mexico, at Carlsbad
Oregon, at Portland (10-12)
Utah, at Salt Lake City (3-5)
Wyoming, at Casper

September

Southern California, at Los Angeles (13-15)

November

Ohio, at Cleveland (7-10)

January 1944

Rhode Island, at Providence

STATE BOARDS OF DENTAL EXAMINERS

California, at San Francisco, October 25 and at Los Angeles, November 29. Kenneth I. Nesbitt, 515 Van Ness Ave., San Francisco, Secretary.

Connecticut, at Hartford, June 15-19. Clarence G. Brooks, 302 State St., New London, Recorder.

Delaware, at Wilmington, June 15-17 (dental hygienists). Charles R. Jefferis, Medical Arts Bldg., Wilmington, Secretary.

Iowa, at Iowa City, August 2-6. Harry G. Bolks, Sioux City, Secretary.

New Jersey, June 28-July 2. J. Frank Burke, 150 E. State St., Trenton, Acting Secretary.

New Mexico, at Santa Fe, June 14-17. J. J. Clarke, Artesia, Secretary.

North Dakota at Fargo, July 12-15. R. A. Andrews, Carrington, Secretary.

Pennsylvania, at Pittsburgh and Philadelphia, May 27-28 (dental hygienists). Reuben E. V. Miller, 61 N. Third St., Easton, Secretary.

Rhode Island, May 25-26. Archie A. Albert, 84 Broad St., Pawtucket, Secretary.

South Dakota, at Sioux Falls, June 20-24. T. E. Barrington, Rapid City, Secretary.

Vermont, at Montpelier, June 28-30. Charles I. Taggart, 139 Bank St., Burlington, Secretary.

West Virginia, at Charleston, June 28. R. H. Davis, 510 Goff Bldg., Clarksburg, Secretary.

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS

THE twenty-fifth annual meeting of the American Society of Oral Surgeons and Exodontists will be held at the Netherland-Plaza Hotel, Cincinnati, Ohio, October 8-9.

HARRY BEAR, *Secretary,*
410 Professional Bldg.,
Richmond, Va.

CLEVELAND DENTAL SOCIETY SPRING CLINIC

THE annual spring clinic meeting of the Cleveland Dental Society will be held May 10-12 at the Statler Hotel.

ALBIUN F. SADD, *Chairman,*
Publicity Committee,
7904 Superior Ave.,
Cleveland.

KANSAS STATE DENTAL ASSISTANTS ASSOCIATION

THE Kansas State Dental Assistants Association will meet in the Hotel Continental, Kansas City, Mo., May 11-13.

CREOLA-CHARLES BAKER,
Program Chairman,
Pratt.

MONTREAL DENTAL CLUB FALL CLINIC

THE Nineteenth Annual Fall Clinic under the auspices of the Montreal Dental Club will be held at the Mount Royal Hotel, Montreal, Canada, October 20-22. For further information, apply to

M. L. DONIGAN, *Director,*
Drummond Medical Bldg.,
Montreal.

NATIONAL BOARD OF DENTAL EXAMINERS

THE National Board of Dental Examiners will hold its next session for the examination of candidates in Parts 1 and 2, May 3-4, in schools where there are five or more candidates. For further information and application blanks, address

GORDON L. TEALL, *Secretary,*
514 Delaware St.
Hiawatha, Kan.

NEW YORK SOCIETY OF ORTHODONTISTS

THE fall meeting of the New York Society of Orthodontists will be held at the Hotel Waldorf-Astoria, New York, November 8-9.

NORMAN L. HILLYER, *Secretary,*
Professional Bldg.,
Hempstead, N. Y.

NEW YORK STATE SOCIETY OF DENTISTRY FOR CHILDREN

THE annual meeting of the New York State Society of Dentistry for Children, component of the American Society of Dentistry for Children, will be held May 21 at the Hotel Syracuse, Syracuse, at 12 m. Hiram A. Jones, director, Division of Health and Physical Education, University of the State

of New York, will speak on "The Dental Aspects of the War Physical Fitness Program," immediately after the luncheon. After the election and installation of officers, there will be a brief program and demonstration of children's dentistry, prepared by Elmer J. Pammenter, of the Eastman Dental Dispensary, Rochester, N. Y., who will also give a brief résumé of the achievement in safeguarding the health and teeth of American youth.

FLOYD E. GIBBIN, *President.*

ONTARIO DENTAL ASSOCIATION

THE Seventy-Sixth Annual Convention of the Ontario Dental Association will be held at the Royal York Hotel, Toronto, May 17-19. Dentists from the United States and from all parts of Canada will be welcome.

EDMUND A. GRANT, *Secretary,*
86 Bloor St., West,
Toronto.

PAN AMERICAN MEDICAL ASSOCIATION

THE Pan American Medical Association is planning a war congress to be held in New York in May or June. The president of the association, José Arce, of Buenos Aires, on a recent visit to the United States, received the sanction of the U. S. State Department for the congress; subject to conditions that may arise. The section on dentistry is to play an important part and arrangements for the dental program are being made.

ALFRED WALKER, *President,*
501 Madison Ave.,
New York.

ROOT CANAL THERAPY ORGANIZATION

AT the Midwinter Meeting of the Chicago Dental Society, a national group for the study of root canal therapy was organized. W. Clyde Davis was made president, and John H. Hospers, secretary-treasurer. Committees were appointed to draw up a constitution and to select a name, to be submitted at the next regular meeting in Chicago in February 1944. It is hoped that all those who are interested in this fundamental phase of dentistry will associate themselves with the group. Those joining before the final organization will be considered charter members. Annual dues were temporarily set at $2. All correspondence should be addressed to

JOHN H. HOSPERS, *Secretary,*
25 E. Washington St.,
Chicago, Ill.

ALUMNI MEETING OF WESTERN RESERVE UNIVERSITY DENTAL COLLEGE

THE Alumni Meeting of the Western Reserve University Dental College will be held May 11, at 6:30 p.m., at the Mid-Day Club, Cleveland, Ohio.

HOMER C. ALEXANDER,
Publicity Committee,
105 Windermere Theatre Bldg.,
East Cleveland, Ohio.

WOMEN'S DENTAL SOCIETY OF NEW YORK

THE Women's Dental Society of New York, of which Hannah J. Appel, 760 West End Ave., New York, is president, will hold its next meeting at the Hotel Pennsylvania, May 20, at 8 p.m., with Harry M. Seldin speaking on "Oral Surgery of Interest to the General Practitioner," which will be illustrated with motion pictures. A dinner will precede the scientific meeting, at 6:30 in the cafe.

MARGARET REISS, *Chairman.*

ARIZONA STATE DENTAL SOCIETY

THE next annual meeting of the Arizona State Dental Society will be held in Phoenix, May 7-8.

BLAIR A. GLENNIE, *Secretary,*
Box 1911,
Tucson.

SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Southern California State Dental Association will be held in Los Angeles, at the Ambassador Hotel, September 13-15.

ROBERT L. BORLAND, *Secretary,*
602 Chapman Bldg.,
Los Angeles.

COLORADO STATE DENTAL ASSOCIATION

THE next annual meeting of the Colorado State Dental Association will be held in Denver, at the Cosmopolitan Hotel, June 17-19.

CHARLES K. PHILLIPS, *Secretary,*
529 Majestic Bldg.,
Denver.

CONNECTICUT STATE DENTAL ASSOCIATION

THE next annual meeting of the Connecticut State Dental Association will be held in Hartford, May 7-8.

EARLE S. ARNOLD, *Secretary,*
37 Linnard Road,
West Hartford.

DISTRICT OF COLUMBIA DENTAL SOCIETY

THE next annual meeting of the District of Columbia Dental Society will be held in Washington, June 8.

J. WALTER BERNHARD, *Secretary,*
1835 Eye St., N. W.,
Washington.

GEORGIA DENTAL ASSOCIATION

The next annual meeting of the Georgia Dental Association will be held in Atlanta at the Ansley Hotel, May 17-19.

R. H. MURPHY, *Secretary,*
605 Bankers Insurance Bldg.,
Macon.

ILLINOIS STATE DENTAL SOCIETY

THE next annual meeting of the Illinois State Dental Society will be held in Peoria, May 10-14.

L. H. JACOB, *Secretary,*
634 Jefferson Bldg.,
Peoria.

INDIANA STATE DENTAL ASSOCIATION

THE next annual meeting of the Indiana State Dental Association will be held in Indianapolis, at the Claypool Hotel, May 17-19.

E. E. EWBANK, *Secretary,*
Kingman.

IOWA STATE DENTAL SOCIETY

THE next annual meeting of the Iowa State Dental Society will be held in Des Moines, at the Hotel Fort Des Moines, May 3-5.

C. S. FOSTER, *Secretary,*
803 Dows Bldg.,
Cedar Rapids.

KANSAS STATE DENTAL ASSOCIATION

THE next annual meeting of the Kansas State Dental Association will be held in Kansas City, Mo., May 11-13.

FRED A. RICHMOND, *Secretary,*
Huron Bldg.,
Kansas City, Kan.

MARYLAND STATE DENTAL ASSOCIATION

THE annual meeting of the Maryland State Dental Association will be held in Baltimore, May 3-4.

PAUL A. DEEMS, *Secretary,*
Medical Arts Bldg.,
Baltimore.

MASSACHUSETTS DENTAL SOCIETY

THE next meeting of the Massachusetts Dental Society will be held in Boston, at the Hotel Statler, May 17-20.

PHILIP E. ADAMS, *Secretary,*
106 Marlborough St.,
Boston.

MISSOURI STATE DENTAL ASSOCIATION

THE next annual meeting of the Missouri State Dental Association will be held in Kansas City, May 11-13, in conjunction with the Kansas State Dental Association meeting.

C. W. DIGGS, *Secretary,*
Columbia.

MONTANA STATE DENTAL ASSOCIATION

THE next annual meeting of the Montana State Dental Association will be held in Helena, May 6-8.

T. T. RIDER, *Secretary,*
Missoula.

NEBRASKA STATE DENTAL ASSOCIATION

THE next annual meeting of the Nebraska State Dental Association will be held in Omaha, at the Fontenella Hotel, May 10-12.

C. A. BUMSTEAD, *Secretary,*
Stuart Bldg.,
Lincoln.

NEVADA STATE DENTAL ASSOCIATION

THE next annual meeting of the Nevada State Dental Association will be held in Reno, in June.

LOUIS M. NELSON, *Secretary,*
Reno.

NEW HAMPSHIRE DENTAL SOCIETY

THE next annual meeting of the New Hampshire Dental Society will be held in Manchester, June 9.

FLOYD E. WILLIAMS, *Secretary,*
Manchester.

NEW JERSEY STATE DENTAL SOCIETY

THE next meeting of the New Jersey State Dental Society will be held in Newark, at the Newark Athletic Club, May 4-5.

F. K. HEAZELTON, *Secretary,*
223 East Hanover St.,
Trenton.

NEW MEXICO STATE DENTAL SOCIETY

THE next annual meeting of the New Mexico State Dental Society will be held in Carlsbad in June.

J. S. EILAR, *Secretary,*
Albuquerque.

DENTAL SOCIETY OF THE STATE OF NEW YORK

THE next annual meeting of the Dental Society of the State of New York will be held in Syracuse, at the Hotel Syracuse, May 18-21.

CHARLES A. WILKIE, *Secretary,*
One Hanson Place,
Brooklyn.

NORTH CAROLINA DENTAL SOCIETY

THE next annual meeting of the North Carolina Dental Society will be held in Raleigh, at the Sir Walter Hotel, May 3-5.

E. M. MEDLIN, *Secretary,*
Aberdeen.

OHIO STATE DENTAL SOCIETY

THE next annual meeting of the Ohio State Dental Society will be held in Cleveland, November 7-10.

EDWARD C. MILLS, *Secretary,*
255 E. Broad St.,
Columbus.

NORTH DAKOTA STATE DENTAL ASSOCIATION

THE 1943 meeting of the North Dakota State Dental Association will be held in Fargo, May 10-11.

W. C. FOLLETT, *President,*
Devils Lake.

OREGON STATE DENTAL ASSOCIATION

THE next annual meeting of the Oregon State Dental Association will be held in Portland, June 10-12.

F. W. HOLLISTER, *Secretary,*
Selling Bldg.,
Portland.

PENNSYLVANIA STATE DENTAL SOCIETY

THE next annual meeting of the Pennsylvania State Dental Society will be held in Pittsburgh, at the William Penn Hotel, May 4-6.

EDWARD R. ASTON, *Secretary,*
421 Market St.,
Kingston.

RHODE ISLAND STATE DENTAL SOCIETY

THE next meeting of the Rhode Island State Dental Society will be held in Providence in January 1944.

CHARLES F. MCKIVERGAN,
Secretary Pro Tem.,
102 Waterman St.,
Providence.

SOUTH CAROLINA STATE DENTAL ASSOCIATION

THE next annual meeting of the South

Carolina State Dental Association will be held in Columbia in May.

P. B. HAIR, *Secretary*,
Spartanburg.

SOUTH DAKOTA STATE DENTAL SOCIETY

THE next annual meeting of the South Dakota State Dental Society will be held in Huron, May 9-11.

ERNEST W. ELMEN, *Secretary*,
Sioux Falls.

UTAH STATE DENTAL ASSOCIATION

THE next annual meeting of the Utah State Dental Association will be held in Salt Lake City, June 3-5.

C. G. GREEN, *Secretary*,
1001 Boston Bldg.,
Salt Lake City.

VERMONT STATE DENTAL SOCIETY

THE next annual meeting of the Vermont State Dental Society will be held in Burlington, May 19-20.

J. GILLAM IRONS, *Secretary*,
Bennington.

WEST VIRGINIA STATE DENTAL SOCIETY

THE next annual meeting of the West Virginia State Dental Society will be held in Parkersburg, May 17-19.

M. H. NICHOLSON, *Secretary*,
Bluefield.

WYOMING STATE DENTAL ASSOCIATION

THE next annual meeting of the Wyoming State Dental Association will be held in Casper in June.

J. D. MCNIFF, *Secretary*,
Laramie.

BOARD OF DENTAL EXAMINERS OF CALIFORNIA

THE next examinations to be conducted by the Board of Dental Examiners of California for licensure in the State of California will be held in San Francisco commencing October 25 and in Los Angeles commencing November 29. All credentials must be in the office of the secretary, Room 203, 515 Van Ness Ave., San Francisco, at least twenty days prior to the examinations. Address all communications to

KENNETH I. NESBITT, *Secretary*.

CONNECTICUT DENTAL COMMISSION

THE Connecticut Dental Commission will meet in Hartford, June 15-19, for the examination of applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least ten days before the meeting. For application blanks and further information, apply to

CLARENCE G. BROOKS, *Recorder*,
302 State St.,
New London.

DELAWARE STATE BOARD OF DENTAL EXAMINERS

THE next examinations conducted by the Delaware State Board of Dental Examiners will be held June 15-17 for applicants for licenses as dental hygienists. All examinations will be held in Wilmington.

CHARLES R. JEFFERIS, *Secretary*,
Medical Arts Bldg.,
Wilmington.

IOWA STATE BOARD OF DENTAL EXAMINERS

THE Iowa State Board of Dental Examiners will hold its next examination at the College of Dentistry, State University of Iowa, Iowa City, August 2-6. Application with necessary fee must be in the hands of Mr. H. W. Grefe, director of licensure and registration, Iowa State Department of Health, Des Moines, fifteen days before the examination.

HARRY G. BOLKS, *Secretary*,
Sioux City.

NEW JERSEY STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY

THE State Board of Registration and Examination in Dentistry of New Jersey will hold its next regular examinations commenc-

ing June 28 and continuing for five days. On application to the secretary, a copy of the requirements and rules, instruction sheet and preliminary application will be forwarded. Candidates were required to file the preliminary application blank, with the examination fee of $25, on or before March 15. Future schedules will be announced.

J. FRANK BURKE, *Acting Secretary,*
150 E. State St.,
Trenton.

NEW MEXICO BOARD OF DENTAL EXAMINERS

THE New Mexico Board of Dental Examiners will hold its next meeting June 14-17 in Santa Fe. For further information, address

J. J. CLARKE, *Secretary,*
Artesia.

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

THE North Dakota State Board of Dental Examiners will hold its next examination in the Gardner Hotel, Fargo, July 12-15. For further information and applications, address

R. A. ANDREWS, *Secretary,*
Carrington.

DENTAL COUNCIL AND EXAMINING BOARD OF THE COMMONWEALTH OF PENNSYLVANIA

THE Dental Council and Examining Board of the Commonwealth of Pennsylvania will give an examination for license to practice dental hygiene in Philadelphia and Pittsburgh, May 27-28. For further information and application blanks, address the Department of Public Instruction, Bureau of Professional Licensing, Dental Division, Harrisburg.

REUBEN E. MILLER, *Secretary,*
61 N. Third St.,
Easton.

RHODE ISLAND BOARD OF EXAMINERS IN DENTISTRY

THE next examination of the Rhode Island Board of Examiners in Dentistry will be held May 25-26.

ARCHIE A. ALBERT, *Secretary,*
84 Broad St.,
Pawtucket.

SOUTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

THE South Dakota State Board of Dental Examiners will conduct examinations for a license to practice dentistry or to practice dental hygiene in South Dakota June 20-24 at Sioux Falls. For further information and applications, address

T. E. BARRINGTON, *Secretary,*
Rapid City.

VERMONT STATE BOARD OF DENTAL EXAMINERS

THE Vermont State Board of Dental Examiners will meet for the purpose of examining candidates in dentistry and dental hygiene, June 28-30, at the State House, Montpelier.

CHARLES I. TAGGART, *Secretary,*
139 Bank St.,
Burlington.

WEST VIRGINIA STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the West Virginia State Board of Dental Examiners will be held in Charleston, commencing June 28. Applicants for license to practice dentistry or dental hygiene will be examined. Applications must be in the hands of the secretary ten days prior to the meeting. For application blanks and information, apply to

R. H. DAVIS, *Secretary,*
510-515 Goff Bldg.,
Clarksburg.

EXAMINATION FOR APPOINTMENT IN THE DENTAL CORPS OF THE NAVY

THE next examination for appointment as assistant dental surgeon, U. S. Navy (lieutenant [junior grade], Dental Corps, U. S. Navy) will be held at the Naval Training Station, Norfolk, Va.; the Naval Training Station, Great Lakes, Ill.; the Naval Training Station, San Diego, Calif., and the Naval Dental School, National Naval Medical Center, Bethesda, Md., May 3. Application for this examination should be made to the chief of the Bureau of Medicine and Surgery, Navy Department, Washington, D. C. Applicants for appointment as assistant dental surgeon must be citizens of the United States, more than 21, but less than 32

years of age at the time of acceptance of appointment, and graduates of a class A dental school. A circular of information listing physical and other requirements for appointment, subjects in which applicants are examined, and other data pertaining to salary, allowances, etc., can be obtained from the Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

DENTAL INTERNSHIPS

THE Greater New York Conference of Hospital Dental Services, comprised of a group of men who are chiefs of dental services, would like to aid those men seeking dental internships in hospitals in the metropolitan area. Those who are not in the Army or the Navy and who are desirous of obtaining internships should communicate with

MARY E. REILLY, *Secretary,*
386 Fourth Ave.,
New York, N. Y.

VOLUNTEERSHIPS AND EXTERNSHIPS, BRONX HOSPITAL

THERE are several volunteerships and externships available for recent graduates at the dental clinic, Bronx Hospital, in the following departments: oral surgery and exodontia, operative dentistry, orthodontia, surgical periodontia and root canal therapy. Applicants address David Wurzel, director of the Dental Department, Bronx Hospital, 169th St. & Fulton Ave., Bronx, New York.

RESIDENCIES AND INTERNSHIPS

THERE will be available July 1 at the Sea View Hospital, New York, N. Y., two dental residencies and two dental internships for a one year period. The Sea View Hospital, probably the largest tuberculosis hospital in the world, offers exceptional opportunities in most phases of dentistry. The dental residencies include a stipend of $1,200 annually plus maintenance; the internships, a stipend of $15 monthly plus maintenance. Application forms can be obtained from the medical superintendent, Sea View Hospital, Staten Island, New York.

RALPH HOWARD BRODSKY, *Director,*
Division of Oral Surgery.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation of the New York and the Eastman Dental Clinic, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid to dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Fellow in Dentistry and, according to his interest, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduate Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean,*
Rochester, N. Y.

OHIO STATE UNIVERSITY POSTGRADUATE COURSE IN DENTISTRY

THE College of Dentistry of Ohio State University, at Columbus, offers postgraduate courses in dentistry that are especially designed for the general practitioner who may wish to amplify his training in any of the following fields: oral surgery, prosthodontia, x-ray, crown and bridge, periodontia, operative dentistry and root canal therapy. The length and dates of the courses are as follows:

X-ray	June 7 to 11
Oral surgery	June 14 to 18
Prosthodontia	June 14 to 19
Crown and bridge	June 14 to 19

Operative dentistry	June 14 to 18
Root canal therapy	June 14 to 18
Periodontia	One day per week for ten weeks beginning June 23

The fees for these courses will be $50 a week, with the registration limited to ten men in each course, with the exception of prosthodontia, which will be $100 for the week's course, with registration limited to five.

It is the aim of these courses to teach new technics as well as to review the fundamentals. Further information and application blanks can be secured from the office of the dean, College of Dentistry, Ohio State University, Columbus.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING MARCH 1943

March 2

2,312,828, EMIL G. ADAMSSON. Toothbrush.

March 9

2,313,085, ROBERT NEIMAN, ROBERT C. ERNST AND EDMUND A. STEINBOCK. Investment composition.

2,313,086, ROBERT NEIMAN, ROBERT C. ERNST AND EDMUND A. STEINBOCK. Investment composition.

2,313,483, ARTHUR E. SMITH. Ampoule.

2,313,484, ARTHUR E. SMITH. Hypodermic syringe.

2,313,535, EWALD C. GLITZKE. Bite registering device.

March 16

2,313,905, LOREN WALLIN. Hypodermic needle rack.

2,313,999, JOSEPH KREISELMAN. Apparatus for administering oxygen.

2,314,094, MERVYN C. LASKY. Dental bridge.

2,314,117, DWIGHT S. BECKNER. Shielded rotary toothbrush.

March 23

2,314,377, WALTER J. VAN ROSSEM. Molding flask.

2,314,378, WALTER J. VAN ROSSEM. Molding method.

2,314,503, WALTER A. KURGAS. Artificial tooth.

2,314,626, ROBERT NEIMAN. Investment.

2,314,674, ULYSSES S. WALTON. Denture.

March 30

2,314,957, HENRY M. THORNTON AND CHARLES DIETZ. Method of making artificial teeth.

2,315,016, JOHN C. SHOTTON. Painless drilling dental instrument.

2,315,061, EMORY O. KING. Protective composition of matter for users of x-rays.

2,315,338, JESSE C. KING. Templet carrier for articulators.

2,315,465, VANCE V. VALLANDIGHAM. Dental impression material.

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